

APPENDIX 5

HYDROLOGY & HYDRAULICS

San Bernardino County

Hydrology & Hydraulics

Preliminary Report

Prepared: February, 2021

Revised: -

FOR:

Maple Hill Fields Complex

Prepared For:

Mr. Steve Foulkes

Bear Valley Unified School District Education Foundation

P.O. Box 1529

Big Bear City, CA 92314

909-866-4473

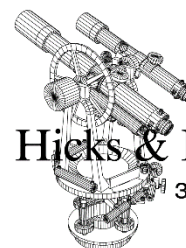
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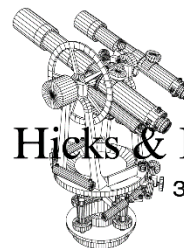
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Dated: February 3, 2021



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Bear Valley Unified School District Education Foundation
Maple Hill Fields Complex

Hydrology & Hydraulics
Preliminary Report

GENERAL

The subject property of this report is approximately 17 acres of undeveloped woodland on the ridgeline north of and abutting the Baldwin Lake Elementary School, on the north side of Sugarloaf on Baldwin Lane.

This report covers the existing drainage conditions only. The watershed runoff rates are determined using San Bernardino County standards and computer calculations. Rational Method Hydrology Computer Program Package, developed by Advanced Engineering Software (AES), is used to calculate the storm runoff rates.

The hydrologic soil type, ground cover and development type are user specified. The hydrologic soil type is as provided in the County Manual. The ground cover and development type are based on observation and experience. The runoff rates are from the NOAA Hydrometeorological Design Studies Center, as included in this report. Rational Hydrology analysis was performed for the theoretical 2-year, 10-year and 100-year storm events. The detailed summary computer output for each analysis is attached as Exhibits. The existing conditions and proposed conditions maps are provided, illustrating the layout for, and as referenced by, the computer models.

EXISTING CONDITIONS

This drainage study includes runoff analysis of the watershed covering the subject property. The watershed is undeveloped forested mountainous terrain with fair coverage.

The runoff flows away from the peak and ridgeline within the study area. Because of the configuration, and the proposed development of the ridgeline, there are several small subareas. The existing flow characteristics are primarily sheet flow, with rivulets and flowlines beginning to develop. The existing subareas were selected to provide comparative analysis to the proposed configuration.

The existing hydrology is calculated based on the existing coverage as illustrated on the accompanying map. The calculated 2-year, 10-year and 100-year runoff for the existing conditions is included in this report. The existing conditions reference map is also attached.

PROPOSED CONDITIONS

The proposed development is a sports complex consisting of an access road from Baldwin Lane, parking areas, and three sports fields; all as shown on the attached proposed conditions map.

The proposed development will include drainage structures to convey the

runoff to natural flowlines, or to flow dissipation structures. A basin is proposed at the entrance near Baldwin Lane. The sports fields will have subsurface storm drains that outlet to the natural flowline for that drainage area.

The sports field areas provide a minor increase in peak flowrate. The parking and access road areas exhibit a marked increase due to the conversion from undeveloped land to paved areas. The largest outfall flowrate will pass through the proposed basin.

The proposed hydrology is calculated based on the proposed development coverage as illustrated on the accompanying map. The calculated 2-year, 10-year and 100-year runoff for the proposed conditions is included in this report. The proposed conditions reference map is also attached.



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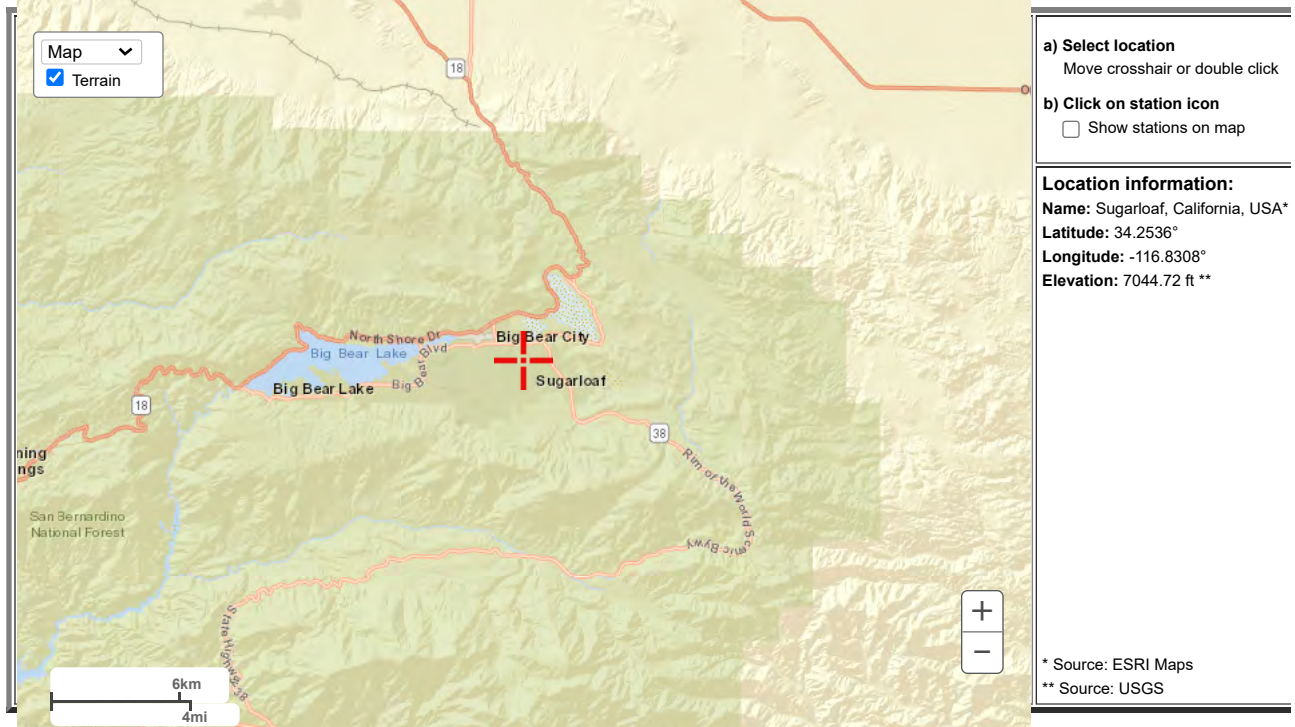
NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

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 (if ESRI interactive map is not loading, try adding the host: <https://is.arcgis.com/> to the firewall, or contact us at hdsc.questions@noaa.gov):

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

PDS-based 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	0.143 (0.118-0.174)	0.196 (0.162-0.239)	0.273 (0.225-0.334)	0.340 (0.278-0.421)	0.442 (0.349-0.564)	0.527 (0.408-0.687)	0.621 (0.470-0.830)	0.727 (0.534-0.998)	0.884 (0.624-1.27)	1.13 (0.768-1.67)
10-min	0.204 (0.169-0.249)	0.281 (0.232-0.343)	0.391 (0.322-0.479)	0.488 (0.399-0.603)	0.633 (0.501-0.808)	0.756 (0.585-0.985)	0.890 (0.673-1.19)	1.04 (0.766-1.43)	1.27 (0.894-1.81)	1.62 (1.10-2.39)
15-min	0.247 (0.205-0.302)	0.340 (0.281-0.415)	0.473 (0.390-0.579)	0.590 (0.483-0.729)	0.766 (0.606-0.978)	0.914 (0.708-1.19)	1.08 (0.814-1.44)	1.26 (0.926-1.73)	1.53 (1.08-2.19)	1.95 (1.33-2.90)
30-min	0.356 (0.294-0.434)	0.489 (0.404-0.597)	0.680 (0.561-0.833)	0.849 (0.695-1.05)	1.10 (0.872-1.41)	1.32 (1.02-1.71)	1.55 (1.17-2.07)	1.81 (1.33-2.49)	2.21 (1.56-3.16)	2.81 (1.92-4.17)
60-min	0.504 (0.417-0.615)	0.693 (0.573-0.847)	0.964 (0.795-1.18)	1.20 (0.984-1.49)	1.56 (1.24-1.99)	1.86 (1.44-2.43)	2.20 (1.66-2.93)	2.57 (1.89-3.53)	3.13 (2.20-4.47)	3.98 (2.72-5.90)
2-hr	0.722 (0.598-0.881)	0.982 (0.812-1.20)	1.35 (1.11-1.65)	1.66 (1.36-2.05)	2.12 (1.67-2.70)	2.49 (1.93-3.25)	2.89 (2.19-3.86)	3.33 (2.44-4.57)	3.96 (2.79-5.67)	4.48 (3.05-6.64)
3-hr	0.897 (0.742-1.09)	1.21 (1.00-1.48)	1.65 (1.36-2.02)	2.03 (1.66-2.50)	2.57 (2.03-3.28)	3.01 (2.33-3.93)	3.48 (2.63-4.65)	3.99 (2.93-5.48)	4.72 (3.33-6.75)	5.31 (3.62-7.87)
6-hr	1.31 (1.08-1.60)	1.76 (1.45-2.15)	2.38 (1.97-2.92)	2.92 (2.39-3.61)	3.69 (2.92-4.71)	4.32 (3.34-5.63)	4.98 (3.76-6.65)	5.69 (4.19-7.82)	6.72 (4.74-9.62)	7.55 (5.15-11.2)

12-hr	1.80 (1.49-2.20)	2.45 (2.03-3.00)	3.37 (2.78-4.13)	4.17 (3.41-5.15)	5.34 (4.22-6.81)	6.30 (4.88-8.21)	7.33 (5.55-9.80)	8.47 (6.23-11.6)	10.1 (7.14-14.5)	11.5 (7.83-17.0)
24-hr	2.54 (2.25-2.93)	3.52 (3.11-4.06)	4.92 (4.35-5.69)	6.17 (5.40-7.19)	8.04 (6.81-9.68)	9.62 (7.99-11.8)	11.4 (9.21-14.3)	13.3 (10.5-17.2)	16.3 (12.3-21.9)	18.8 (13.7-26.2)
2-day	3.21 (2.84-3.69)	4.44 (3.93-5.12)	6.26 (5.52-7.23)	7.90 (6.92-9.21)	10.4 (8.82-12.5)	12.6 (10.4-15.4)	15.0 (12.2-18.9)	17.8 (14.0-23.0)	22.0 (16.7-29.7)	25.8 (18.8-35.9)
3-day	3.53 (3.13-4.07)	4.89 (4.33-5.64)	6.92 (6.11-8.00)	8.77 (7.68-10.2)	11.6 (9.84-14.0)	14.1 (11.7-17.3)	16.9 (13.7-21.3)	20.1 (15.9-26.1)	25.1 (19.0-33.9)	29.6 (21.6-41.2)
4-day	3.79 (3.36-4.36)	5.27 (4.66-6.07)	7.47 (6.59-8.63)	9.48 (8.30-11.0)	12.6 (10.7-15.2)	15.3 (12.7-18.8)	18.4 (14.9-23.2)	21.9 (17.3-28.4)	27.5 (20.8-37.0)	32.3 (23.7-45.1)
7-day	4.31 (3.82-4.96)	6.05 (5.35-6.97)	8.63 (7.62-9.98)	11.0 (9.62-12.8)	14.6 (12.4-17.6)	17.8 (14.8-21.8)	21.3 (17.3-26.9)	25.4 (20.0-32.9)	31.7 (24.0-42.8)	37.3 (27.3-52.0)
10-day	4.64 (4.11-5.34)	6.55 (5.80-7.56)	9.39 (8.29-10.9)	12.0 (10.5-14.0)	15.9 (13.5-19.2)	19.3 (16.1-23.8)	23.2 (18.8-29.2)	27.6 (21.7-35.7)	34.3 (26.0-46.2)	40.2 (29.4-56.0)
20-day	5.59 (4.95-6.44)	7.96 (7.04-9.18)	11.4 (10.1-13.2)	14.6 (12.8-17.0)	19.4 (16.4-23.3)	23.5 (19.5-28.8)	28.0 (22.7-35.3)	33.2 (26.2-43.0)	41.1 (31.1-55.4)	47.9 (35.0-66.8)
30-day	6.55 (5.81-7.55)	9.33 (8.26-10.8)	13.4 (11.8-15.5)	17.1 (14.9-19.9)	22.6 (19.1-27.2)	27.3 (22.7-33.5)	32.5 (26.4-40.9)	38.4 (30.3-49.7)	47.3 (35.8-63.7)	54.9 (40.1-76.5)
45-day	7.87 (6.97-9.06)	11.1 (9.87-12.9)	15.9 (14.1-18.4)	20.2 (17.7-23.5)	26.6 (22.5-32.0)	32.0 (26.6-39.4)	38.0 (30.8-47.9)	44.8 (35.3-57.9)	54.8 (41.4-73.8)	63.3 (46.3-88.3)
60-day	9.15 (8.11-10.5)	12.9 (11.4-14.8)	18.2 (16.1-21.1)	23.0 (20.2-26.8)	30.2 (25.6-36.4)	36.3 (30.1-44.6)	42.9 (34.8-54.0)	50.3 (39.7-65.1)	61.3 (46.4-82.6)	70.6 (51.7-98.5)

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.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

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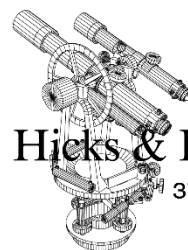
San Bernardino County

Hydrology & Hydraulics

Preliminary Report

EXISTING HYDROLOGY

2-YEAR RUNOFF



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Analysis prepared by:

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FILE NAME: 0193HEA2.DAT
TIME/DATE OF STUDY: 12:57 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 3.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 675.00
ELEVATION DATA: UPSTREAM(FEET) = 7056.00 DOWNSTREAM(FEET) = 6957.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 14.037$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.916

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.)
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NATURAL FAIR COVER

"WOODLAND, GRASS" C 1.94 0.43 1.000 77 14.04

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 2.59

TOTAL AREA(ACRES) = 1.94 PEAK FLOW RATE(CFS) = 2.59

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MIN.) = 14.04

RAINFALL INTENSITY(INCH/HR) = 1.92

AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$

AREA-AVERAGED $A_p = 1.00$

EFFECTIVE STREAM AREA(ACRES) = 1.94

TOTAL STREAM AREA(ACRES) = 1.94

PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.59

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 812.00

ELEVATION DATA: UPSTREAM(FEET) = 7053.00 DOWNSTREAM(FEET) = 6957.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 15.779$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.765

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.)
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NATURAL FAIR COVER

"WOODLAND, GRASS" C 5.21 0.43 1.000 77 15.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 6.24

TOTAL AREA(ACRES) = 5.21 PEAK FLOW RATE(CFS) = 6.24

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 15.78
RAINFALL INTENSITY(INCH/HR) = 1.77
AREA-AVERAGED Fm(INCH/HR) = 0.43
AREA-AVERAGED Fp(INCH/HR) = 0.43
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 5.21
TOTAL STREAM AREA(ACRES) = 5.21
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.24

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	2.59	14.04	1.916	0.43(0.43)	1.00	1.9	1.00
2	6.24	15.78	1.765	0.43(0.43)	1.00	5.2	2.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.77	14.04	1.916	0.43(0.43)	1.00	6.6	1.00
2	8.57	15.78	1.765	0.43(0.43)	1.00	7.2	2.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 8.77 Tc(MIN.) = 14.04
EFFECTIVE AREA(ACRES) = 6.57 AREA-AVERAGED Fm(INCH/HR) = 0.43
AREA-AVERAGED Fp(INCH/HR) = 0.43 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 7.2
LONGEST FLOWPATH FROM NODE 2.00 TO NODE 3.00 = 812.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 53

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 6957.00 DOWNSTREAM(FEET) = 6940.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 176.00 CHANNEL SLOPE = 0.0966
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .0966 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
CHANNEL FLOW THRU SUBAREA(CFS) = 8.77
FLOW VELOCITY(FEET/SEC) = 3.59 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 0.82 Tc(MIN.) = 14.85
LONGEST FLOWPATH FROM NODE 2.00 TO NODE 4.00 = 988.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 14.85

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.841

SUBAREA LOSS RATE DATA(AMC II):

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

"WOODLAND, GRASS" C 1.51 0.43 1.000 77

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.43

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 1.51 SUBAREA RUNOFF(CFS) = 1.91

EFFECTIVE AREA(ACRES) = 8.08 AREA-AVERAGED Fm(INCH/HR) = 0.43

AREA-AVERAGED Fp(INCH/HR) = 0.43 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 8.7 PEAK FLOW RATE(CFS) = 10.24

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.7 TC(MIN.) = 14.85

EFFECTIVE AREA(ACRES) = 8.08 AREA-AVERAGED Fm(INCH/HR)= 0.43

AREA-AVERAGED Fp(INCH/HR) = 0.43 AREA-AVERAGED Ap = 1.000

PEAK FLOW RATE(CFS) = 10.24

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.24	14.85	1.841	0.43(0.43)	1.00	8.1	1.00
2	9.89	16.60	1.703	0.43(0.43)	1.00	8.7	2.00

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEB2.DAT
TIME/DATE OF STUDY: 13:05 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 477.00
ELEVATION DATA: UPSTREAM(FEET) = 7061.00 DOWNSTREAM(FEET) = 7008.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.914$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.031

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.41	0.43	1.000	77	12.91

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 2.03

TOTAL AREA(ACRES) = 1.41 PEAK FLOW RATE(CFS) = 2.03

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.4 $T_c(MIN.) = 12.91$

EFFECTIVE AREA(ACRES) = 1.41 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 2.03

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END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

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FILE NAME: 0193HEC2.DAT
TIME/DATE OF STUDY: 13:05 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 362.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.40 DOWNSTREAM(FEET) = 7009.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 10.847$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.295

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.25	0.43	1.000	77	10.85

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 2.09

TOTAL AREA(ACRES) = 1.25 PEAK FLOW RATE(CFS) = 2.09

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.2 $T_c(MIN.) = 10.85$

EFFECTIVE AREA(ACRES) = 1.25 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 2.09

=====

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HED2.DAT
TIME/DATE OF STUDY: 13:10 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 302.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.40 DOWNSTREAM(FEET) = 7037.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 11.201$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.244

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.59	0.43	1.000	77	11.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 0.96

TOTAL AREA(ACRES) = 0.59 PEAK FLOW RATE(CFS) = 0.96

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.6 $T_c(MIN.) = 11.20$

EFFECTIVE AREA(ACRES) = 0.59 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 0.96

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEE2.DAT
TIME/DATE OF STUDY: 13:13 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 805.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.00 DOWNSTREAM(FEET) = 7028.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 19.099$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.544

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	2.88	0.43	1.000	77	19.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 2.88

TOTAL AREA(ACRES) = 2.88 PEAK FLOW RATE(CFS) = 2.88

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.9 $T_c(MIN.) = 19.10$

EFFECTIVE AREA(ACRES) = 2.88 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 2.88

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEF2.DAT
TIME/DATE OF STUDY: 13:22 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 327.00
ELEVATION DATA: UPSTREAM(FEET) = 7043.00 DOWNSTREAM(FEET) = 7022.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.391$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.091

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.83	0.43	1.000	77	12.39

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 1.24

TOTAL AREA(ACRES) = 0.83 PEAK FLOW RATE(CFS) = 1.24

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.8 $T_c(MIN.) = 12.39$

EFFECTIVE AREA(ACRES) = 0.83 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 1.24

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEG2.DAT
TIME/DATE OF STUDY: 13:23 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 993.00
ELEVATION DATA: UPSTREAM(FEET) = 7045.00 DOWNSTREAM(FEET) = 7013.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 22.179$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.391

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.51	0.43	1.000	77	22.18

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 1.30

TOTAL AREA(ACRES) = 1.51 PEAK FLOW RATE(CFS) = 1.30

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.51 $T_c(MIN.) = 22.18$

EFFECTIVE AREA(ACRES) = 1.51 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 1.30

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEH2.DAT
TIME/DATE OF STUDY: 13:25 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 286.00
ELEVATION DATA: UPSTREAM(FEET) = 7018.00 DOWNSTREAM(FEET) = 7005.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.584$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.068

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.24	0.43	1.000	77	12.58

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 0.35

TOTAL AREA(ACRES) = 0.24 PEAK FLOW RATE(CFS) = 0.35

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.2 $T_c(MIN.) = 12.58$

EFFECTIVE AREA(ACRES) = 0.24 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 0.35

=====

=====

END OF RATIONAL METHOD ANALYSIS

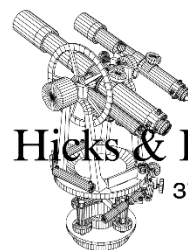
San Bernardino County

Hydrology & Hydraulics

Preliminary Report

EXISTING HYDROLOGY

10-YEAR RUNOFF



Hicks & Hartwick, Inc.

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Analysis prepared by:

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FILE NAME: 0193HEAT.DAT
TIME/DATE OF STUDY: 12:57 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 3.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 675.00
ELEVATION DATA: UPSTREAM(FEET) = 7056.00 DOWNSTREAM(FEET) = 6957.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 14.037$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.317

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.)
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NATURAL FAIR COVER

"WOODLAND, GRASS" C 1.94 0.43 1.000 77 14.04

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 5.03

TOTAL AREA(ACRES) = 1.94 PEAK FLOW RATE(CFS) = 5.03

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MIN.) = 14.04

RAINFALL INTENSITY(INCH/HR) = 3.32

AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$

AREA-AVERAGED $A_p = 1.00$

EFFECTIVE STREAM AREA(ACRES) = 1.94

TOTAL STREAM AREA(ACRES) = 1.94

PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.03

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 812.00

ELEVATION DATA: UPSTREAM(FEET) = 7053.00 DOWNSTREAM(FEET) = 6957.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 15.779$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.057

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.)
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NATURAL FAIR COVER

"WOODLAND, GRASS" C 5.21 0.43 1.000 77 15.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 12.30

TOTAL AREA(ACRES) = 5.21 PEAK FLOW RATE(CFS) = 12.30

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.78
 RAINFALL INTENSITY(INCH/HR) = 3.06
 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.43
 AREA-AVERAGED Ap = 1.00
 EFFECTIVE STREAM AREA(ACRES) = 5.21
 TOTAL STREAM AREA(ACRES) = 5.21
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.30

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.03	14.04	3.317	0.43(0.43)	1.00	1.9	1.00
2	12.30	15.78	3.057	0.43(0.43)	1.00	5.2	2.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	17.06	14.04	3.317	0.43(0.43)	1.00	6.6	1.00
2	16.88	15.78	3.057	0.43(0.43)	1.00	7.2	2.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 17.06 Tc(MIN.) = 14.04
 EFFECTIVE AREA(ACRES) = 6.57 AREA-AVERAGED Fm(INCH/HR) = 0.43
 AREA-AVERAGED Fp(INCH/HR) = 0.43 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 7.2
 LONGEST FLOWPATH FROM NODE 2.00 TO NODE 3.00 = 812.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 53

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 6957.00 DOWNSTREAM(FEET) = 6940.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 176.00 CHANNEL SLOPE = 0.0966
 SLOPE ADJUSTMENT CURVE USED:
 EFFECTIVE SLOPE = .0966 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 CHANNEL FLOW THRU SUBAREA(CFS) = 17.06
 FLOW VELOCITY(FEET/SEC) = 4.48 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) = 0.66 Tc(MIN.) = 14.69
 LONGEST FLOWPATH FROM NODE 2.00 TO NODE 4.00 = 988.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 14.69

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.213

SUBAREA LOSS RATE DATA(AMC II):

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

"WOODLAND, GRASS" C 1.51 0.43 1.000 77

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.43

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 1.51 SUBAREA RUNOFF(CFS) = 3.78

EFFECTIVE AREA(ACRES) = 8.08 AREA-AVERAGED Fm(INCH/HR) = 0.43

AREA-AVERAGED Fp(INCH/HR) = 0.43 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 8.7 PEAK FLOW RATE(CFS) = 20.22

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.7 TC(MIN.) = 14.69

EFFECTIVE AREA(ACRES) = 8.08 AREA-AVERAGED Fm(INCH/HR) = 0.43

AREA-AVERAGED Fp(INCH/HR) = 0.43 AREA-AVERAGED Ap = 1.000

PEAK FLOW RATE(CFS) = 20.22

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	20.22	14.69	3.213	0.43(0.43)	1.00	8.1	1.00
2	19.77	16.44	2.970	0.43(0.43)	1.00	8.7	2.00

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEBT.DAT
TIME/DATE OF STUDY: 13:02 02/15/2021
=====

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 477.00
ELEVATION DATA: UPSTREAM(FEET) = 7061.00 DOWNSTREAM(FEET) = 7008.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.914$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.517

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.41	0.43	1.000	77	12.91

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 3.91

TOTAL AREA(ACRES) = 1.41 PEAK FLOW RATE(CFS) = 3.91

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.4 $T_c(MIN.) = 12.91$

EFFECTIVE AREA(ACRES) = 1.41 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 3.91

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HECT.DAT
TIME/DATE OF STUDY: 13:03 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 362.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.40 DOWNSTREAM(FEET) = 7009.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 10.847$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.973

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.25	0.43	1.000	77	10.85

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 3.98

TOTAL AREA(ACRES) = 1.25 PEAK FLOW RATE(CFS) = 3.98

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.2 $T_c(MIN.) = 10.85$

EFFECTIVE AREA(ACRES) = 1.25 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 3.98

=====

=====

END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEDT.DAT
TIME/DATE OF STUDY: 13:10 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 302.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.40 DOWNSTREAM(FEET) = 7037.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 11.201$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.885

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.59	0.43	1.000	77	11.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 1.83

TOTAL AREA(ACRES) = 0.59 PEAK FLOW RATE(CFS) = 1.83

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.6 $T_c(MIN.) = 11.20$

EFFECTIVE AREA(ACRES) = 0.59 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 1.83

=====

=====

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 805.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.00 DOWNSTREAM(FEET) = 7028.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 19.099$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.674

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	2.88	0.43	1.000	77	19.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 5.81

TOTAL AREA(ACRES) = 2.88 PEAK FLOW RATE(CFS) = 5.81

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.9 $T_c(MIN.) = 19.10$

EFFECTIVE AREA(ACRES) = 2.88 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 5.81

=====

=====

END OF RATIONAL METHOD ANALYSIS

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37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0193HEFT.DAT
TIME/DATE OF STUDY: 13:20 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 327.00
ELEVATION DATA: UPSTREAM(FEET) = 7043.00 DOWNSTREAM(FEET) = 7022.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.391$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.620

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.83	0.43	1.000	77	12.39

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 2.38

TOTAL AREA(ACRES) = 0.83 PEAK FLOW RATE(CFS) = 2.38

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.8 $T_c(MIN.) = 12.39$

EFFECTIVE AREA(ACRES) = 0.83 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 2.38

=====

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END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 993.00
ELEVATION DATA: UPSTREAM(FEET) = 7045.00 DOWNSTREAM(FEET) = 7013.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 22.179$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 2.408

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.51	0.43	1.000	77	22.18

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 2.68

TOTAL AREA(ACRES) = 1.51 PEAK FLOW RATE(CFS) = 2.68

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.51 $T_c(MIN.) = 22.18$

EFFECTIVE AREA(ACRES) = 1.51 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 2.68

=====

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END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 286.00
ELEVATION DATA: UPSTREAM(FEET) = 7018.00 DOWNSTREAM(FEET) = 7005.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.584$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.581

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.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.24	0.43	1.000	77	12.58

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.43$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 0.68

TOTAL AREA(ACRES) = 0.24 PEAK FLOW RATE(CFS) = 0.68

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.2 $T_c(MIN.) = 12.58$

EFFECTIVE AREA(ACRES) = 0.24 AREA-AVERAGED $F_m(INCH/HR) = 0.43$

AREA-AVERAGED $F_p(INCH/HR) = 0.43$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 0.68

=====

=====

END OF RATIONAL METHOD ANALYSIS

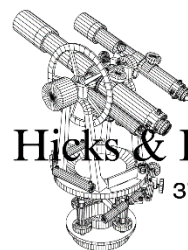
San Bernardino County

Hydrology & Hydraulics

Preliminary Report

EXISTING HYDROLOGY

100-YEAR RUNOFF



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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 3.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 675.00
ELEVATION DATA: UPSTREAM(FEET) = 7056.00 DOWNSTREAM(FEET) = 6957.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 14.037$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.082

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------	-----------------

NATURAL FAIR COVER

"WOODLAND, GRASS" C 1.94 0.19 1.000 92 14.04

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.19

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA RUNOFF(CFS) = 10.29

TOTAL AREA(ACRES) = 1.94 PEAK FLOW RATE(CFS) = 10.29

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MIN.) = 14.04

RAINFALL INTENSITY(INCH/HR) = 6.08

AREA-AVERAGED Fm(INCH/HR) = 0.19

AREA-AVERAGED Fp(INCH/HR) = 0.19

AREA-AVERAGED Ap = 1.00

EFFECTIVE STREAM AREA(ACRES) = 1.94

TOTAL STREAM AREA(ACRES) = 1.94

PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.29

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 812.00

ELEVATION DATA: UPSTREAM(FEET) = 7053.00 DOWNSTREAM(FEET) = 6957.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 15.779$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.604

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------	-----------------

NATURAL FAIR COVER

"WOODLAND, GRASS" C 5.21 0.19 1.000 92 15.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.19

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA RUNOFF(CFS) = 25.38

TOTAL AREA(ACRES) = 5.21 PEAK FLOW RATE(CFS) = 25.38

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 15.78
 RAINFALL INTENSITY(INCH/HR) = 5.60
 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.19
 AREA-AVERAGED Ap = 1.00
 EFFECTIVE STREAM AREA(ACRES) = 5.21
 TOTAL STREAM AREA(ACRES) = 5.21
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 25.38

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.29	14.04	6.082	0.19(0.19)	1.00	1.9	1.00
2	25.38	15.78	5.604	0.19(0.19)	1.00	5.2	2.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	34.86	14.04	6.082	0.19(0.19)	1.00	6.6	1.00
2	34.84	15.78	5.604	0.19(0.19)	1.00	7.2	2.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 34.86 Tc(MIN.) = 14.04
 EFFECTIVE AREA(ACRES) = 6.57 AREA-AVERAGED Fm(INCH/HR) = 0.19
 AREA-AVERAGED Fp(INCH/HR) = 0.19 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 7.2
 LONGEST FLOWPATH FROM NODE 2.00 TO NODE 3.00 = 812.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 53

>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<

>>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 6957.00 DOWNSTREAM(FEET) = 6940.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 176.00 CHANNEL SLOPE = 0.0966
 SLOPE ADJUSTMENT CURVE USED:
 EFFECTIVE SLOPE = .0966 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 CHANNEL FLOW THRU SUBAREA(CFS) = 34.86
 FLOW VELOCITY(FEET/SEC) = 5.68 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) = 0.52 Tc(MIN.) = 14.55
 LONGEST FLOWPATH FROM NODE 2.00 TO NODE 4.00 = 988.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 14.55

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.930

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------

NATURAL FAIR COVER

"WOODLAND, GRASS" C 1.51 0.19 1.000 92

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.19

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA AREA(ACRES) = 1.51 SUBAREA RUNOFF(CFS) = 7.80

EFFECTIVE AREA(ACRES) = 8.08 AREA-AVERAGED Fm(INCH/HR) = 0.19

AREA-AVERAGED Fp(INCH/HR) = 0.19 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 8.7 PEAK FLOW RATE(CFS) = 41.77

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.7 TC(MIN.) = 14.55

EFFECTIVE AREA(ACRES) = 8.08 AREA-AVERAGED Fm(INCH/HR)= 0.19

AREA-AVERAGED Fp(INCH/HR) = 0.19 AREA-AVERAGED Ap = 1.000

PEAK FLOW RATE(CFS) = 41.77

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	41.77	14.55	5.930	0.19(0.19)	1.00	8.1	1.00
2	41.22	16.30	5.479	0.19(0.19)	1.00	8.7	2.00

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END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 477.00
ELEVATION DATA: UPSTREAM(FEET) = 7061.00 DOWNSTREAM(FEET) = 7008.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.914$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.447

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.41	0.19	1.000	92	12.91

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 7.94

TOTAL AREA(ACRES) = 1.41 PEAK FLOW RATE(CFS) = 7.94

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.4 $T_c(MIN.) = 12.91$

EFFECTIVE AREA(ACRES) = 1.41 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 7.94

=====

=====

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0193HECH.DAT
TIME/DATE OF STUDY: 13:01 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 362.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.40 DOWNSTREAM(FEET) = 7009.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 10.847$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 7.284

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.25	0.19	1.000	92	10.85

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 7.98

TOTAL AREA(ACRES) = 1.25 PEAK FLOW RATE(CFS) = 7.98

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.2 $T_c(MIN.) = 10.85$

EFFECTIVE AREA(ACRES) = 1.25 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 7.98

=====

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEDH.DAT
TIME/DATE OF STUDY: 13:09 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 302.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.40 DOWNSTREAM(FEET) = 7037.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 11.201$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 7.123

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.59	0.19	1.000	92	11.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 3.68

TOTAL AREA(ACRES) = 0.59 PEAK FLOW RATE(CFS) = 3.68

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.6 $T_c(MIN.) = 11.20$

EFFECTIVE AREA(ACRES) = 0.59 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 3.68

=====

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEEH.DAT
TIME/DATE OF STUDY: 13:12 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 805.00
ELEVATION DATA: UPSTREAM(FEET) = 7064.00 DOWNSTREAM(FEET) = 7028.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 19.099$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.902

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	2.88	0.19	1.000	92	19.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 12.21

TOTAL AREA(ACRES) = 2.88 PEAK FLOW RATE(CFS) = 12.21

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.9 $T_c(MIN.) = 19.10$

EFFECTIVE AREA(ACRES) = 2.88 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 12.21

=====

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEFH.DAT
TIME/DATE OF STUDY: 13:16 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 327.00
ELEVATION DATA: UPSTREAM(FEET) = 7043.00 DOWNSTREAM(FEET) = 7022.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.391$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.637

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.83	0.19	1.000	92	12.39

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 4.82

TOTAL AREA(ACRES) = 0.83 PEAK FLOW RATE(CFS) = 4.82

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.8 $T_c(MIN.) = 12.39$

EFFECTIVE AREA(ACRES) = 0.83 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 4.82

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEGH.DAT
TIME/DATE OF STUDY: 13:17 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 993.00
ELEVATION DATA: UPSTREAM(FEET) = 7045.00 DOWNSTREAM(FEET) = 7013.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 22.179$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.415

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.51	0.19	1.000	92	22.18

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 5.74

TOTAL AREA(ACRES) = 1.51 PEAK FLOW RATE(CFS) = 5.74

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 22.18$

EFFECTIVE AREA(ACRES) = 1.51 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 5.74

=====

=====

END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HEHH.DAT
TIME/DATE OF STUDY: 13:18 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 286.00
ELEVATION DATA: UPSTREAM(FEET) = 7018.00 DOWNSTREAM(FEET) = 7005.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.584$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.565

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.24	0.19	1.000	92	12.58

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$

SUBAREA RUNOFF(CFS) = 1.38

TOTAL AREA(ACRES) = 0.24 PEAK FLOW RATE(CFS) = 1.38

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.2 $T_c(MIN.) = 12.58$

EFFECTIVE AREA(ACRES) = 0.24 AREA-AVERAGED $F_m(INCH/HR) = 0.19$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 1.000$

PEAK FLOW RATE(CFS) = 1.38

=====

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END OF RATIONAL METHOD ANALYSIS

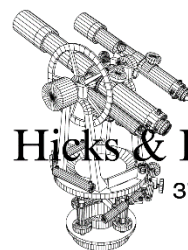
San Bernardino County

Hydrology & Hydraulics

Preliminary Report

PROPOSED HYDROLOGY

2-YEAR RUNOFF



Hicks & Hartwick, Inc.

37 East Olive Ave. Ste C
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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

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FILE NAME: 0193HPA2.DAT
TIME/DATE OF STUDY: 14:37 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7031.50

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 13.199$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.000

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.)
PUBLIC PARK	C	1.64	0.57	0.850	69	13.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 2.24

TOTAL AREA(ACRES) = 1.64 PEAK FLOW RATE(CFS) = 2.24

FLOW PROCESS FROM NODE 2.00 TO NODE 4.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7028.50 DOWNSTREAM(Feet) = 7016.00

FLOW LENGTH(Feet) = 534.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.6 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 6.30

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 2.24

PIPE TRAVEL TIME(MIN.) = 1.41 $T_c(MIN.) = 14.61$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 934.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 14.61$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.863

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
PUBLIC PARK	C	0.48	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.48 SUBAREA RUNOFF(CFS) = 0.60

EFFECTIVE AREA(ACRES) = 2.12 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 2.1 PEAK FLOW RATE(CFS) = 2.64

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7016.00 DOWNSTREAM(Feet) = 7012.50

FLOW LENGTH(Feet) = 28.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 11.97
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.64
 PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 14.65
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 962.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.65
 RAINFALL INTENSITY(INCH/HR) = 1.86
 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 2.12
 TOTAL STREAM AREA(ACRES) = 2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.64

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 375.00
 ELEVATION DATA: UPSTREAM(FEET) = 7019.00 DOWNSTREAM(FEET) = 7015.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.169
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.003
 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.)
PUBLIC PARK	C	1.46	0.57	0.850	69	13.17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF(CFS) = 2.00
 TOTAL AREA(ACRES) = 1.46 PEAK FLOW RATE(CFS) = 2.00

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 13.17
 RAINFALL INTENSITY(INCH/HR) = 2.00

AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 1.46
 TOTAL STREAM AREA(ACRES) = 1.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.00

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	2.64	14.65	1.859	0.57(0.48)	0.85	2.1	1.00
2	2.00	13.17	2.003	0.57(0.48)	0.85	1.5	3.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.62	13.17	2.003	0.57(0.48)	0.85	3.4	3.00
2	4.45	14.65	1.859	0.57(0.48)	0.85	3.6	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 4.62 Tc(MIN.) = 13.17
 EFFECTIVE AREA(ACRES) = 3.37 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 3.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 962.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 8.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 7012.50 DOWNSTREAM(FEET) = 7004.50

FLOW LENGTH(FEET) = 48.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.0 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 15.63

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 4.62

PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 13.22

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 8.00 = 1010.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 8.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MIN.) = 13.22

RAINFALL INTENSITY(INCH/HR) = 2.00

AREA-AVERAGED Fm(INCH/HR) = 0.48

AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 3.37
 TOTAL STREAM AREA(ACRES) = 3.58
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.62

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 346.00

ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 12.409

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.088

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.50	0.57	0.850	69	12.41

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850

SUBAREA RUNOFF(CFS) = 2.17

TOTAL AREA(ACRES) = 1.50 PEAK FLOW RATE(CFS) = 2.17

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7029.00 DOWNSTREAM(FEET) = 7004.50

FLOW LENGTH(FEET) = 225.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.1 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 10.77

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 2.17

PIPE TRAVEL TIME(MIN.) = 0.35 T_c (MIN.) = 12.76

LONGEST FLOWPATH FROM NODE 6.00 TO NODE 8.00 = 571.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 8.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 12.76

RAINFALL INTENSITY(INCH/HR) = 2.05

AREA-AVERAGED Fm(INCH/HR) = 0.48

AREA-AVERAGED Fp(INCH/HR) = 0.57

AREA-AVERAGED $A_p = 0.85$
 EFFECTIVE STREAM AREA(ACRES) = 1.50
 TOTAL STREAM AREA(ACRES) = 1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.17

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	4.62	13.22	1.998	0.57(0.48)	0.85	3.4	3.00
1	4.45	14.70	1.855	0.57(0.48)	0.85	3.6	1.00
2	2.17	12.76	2.048	0.57(0.48)	0.85	1.5	6.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	6.77	12.76	2.048	0.57(0.48)	0.85	4.7	6.00
2	6.72	13.22	1.998	0.57(0.48)	0.85	4.9	3.00
3	6.35	14.70	1.855	0.57(0.48)	0.85	5.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 6.77 Tc(MIN.) = 12.76
 EFFECTIVE AREA(ACRES) = 4.75 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED $A_p = 0.85$
 TOTAL AREA(ACRES) = 5.1
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 8.00 = 1010.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 7004.50 DOWNSTREAM(Feet) = 6994.40
 CHANNEL LENGTH THRU SUBAREA(Feet) = 175.00 CHANNEL SLOPE = 0.0577
 CHANNEL BASE(Feet) = 0.00 "Z" FACTOR = 3.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(Feet) = 2.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 6.77
 FLOW VELOCITY(Feet/Sec.) = 9.08 FLOW DEPTH(Feet) = 0.50
 TRAVEL TIME(MIN.) = 0.32 Tc(MIN.) = 13.08
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 13.08
 RAINFALL INTENSITY(INCH/HR) = 2.01
 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57

AREA-AVERAGED $A_p = 0.85$
EFFECTIVE STREAM AREA(ACRES) = 4.75
TOTAL STREAM AREA(ACRES) = 5.08
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.77

FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 624.00

ELEVATION DATA: UPSTREAM(FEET) = 7043.10 DOWNSTREAM(FEET) = 7015.50

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 11.827

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.160

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.)
PUBLIC PARK	C	2.05	0.57	0.850	69	11.83

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.57

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.850

SUBAREA RUNOFF(CFS) = 3.10

TOTAL AREA(ACRES) = 2.05 PEAK FLOW RATE(CFS) = 3.10

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7012.50 DOWNSTREAM(FEET) = 7002.50

FLOW LENGTH(FEET) = 372.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 7.28

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 3.10

PIPE TRAVEL TIME(MIN.) = 0.85 T_c (MIN.) = 12.68

LONGEST FLOWPATH FROM NODE 9.00 TO NODE 11.00 = 996.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7002.50 DOWNSTREAM(FEET) = 6994.40

CHANNEL LENGTH THRU SUBAREA(FEET) = 98.00 CHANNEL SLOPE = 0.0827

CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 3.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00

CHANNEL FLOW THRU SUBAREA(CFS) = 3.10

FLOW VELOCITY(FEET/SEC.) = 8.52 FLOW DEPTH(FEET) = 0.35

TRAVEL TIME(MIN.) = 0.19 T_c (MIN.) = 12.87

LONGEST FLOWPATH FROM NODE 9.00 TO NODE 12.00 = 1094.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 12.87
RAINFALL INTENSITY(INCH/HR) = 2.04
AREA-AVERAGED Fm(INCH/HR) = 0.48
AREA-AVERAGED Fp(INCH/HR) = 0.57
AREA-AVERAGED Ap = 0.85
EFFECTIVE STREAM AREA(ACRES) = 2.05
TOTAL STREAM AREA(ACRES) = 2.05
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.10

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.77	13.08	2.013	0.57(0.48)	0.85	4.7	6.00
1	6.72	13.54	1.964	0.57(0.48)	0.85	4.9	3.00
1	6.35	15.03	1.827	0.57(0.48)	0.85	5.1	1.00
2	3.10	12.87	2.036	0.57(0.48)	0.85	2.0	9.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.86	12.87	2.036	0.57(0.48)	0.85	6.7	9.00
2	9.83	13.08	2.013	0.57(0.48)	0.85	6.8	6.00
3	9.67	13.54	1.964	0.57(0.48)	0.85	6.9	3.00
4	9.03	15.03	1.827	0.57(0.48)	0.85	7.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 9.86 Tc(MIN.) = 12.87
EFFECTIVE AREA(ACRES) = 6.72 AREA-AVERAGED Fm(INCH/HR) = 0.48
AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
TOTAL AREA(ACRES) = 7.1
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 12.87

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.036

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
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PUBLIC PARK C 0.45 0.57 0.850 69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.45 SUBAREA RUNOFF(CFS) = 0.63
 EFFECTIVE AREA(ACRES) = 7.17 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 7.6 PEAK FLOW RATE(CFS) = 10.04

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 6994.40 DOWNSTREAM(FEET) = 6940.00
 FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 26.91
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 10.04
 PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 12.95
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 13.00 = 1318.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 12.95
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.027
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 PUBLIC PARK C 1.66 0.57 0.850 69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 1.66 SUBAREA RUNOFF(CFS) = 2.31
 EFFECTIVE AREA(ACRES) = 8.83 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 9.2 PEAK FLOW RATE(CFS) = 12.29

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 9.2 TC(MIN.) = 12.95
 EFFECTIVE AREA(ACRES) = 8.83 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.850
 PEAK FLOW RATE(CFS) = 12.29

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	12.29	12.95	2.027	0.57(0.48)	0.85	8.8	9.00
2	12.21	13.16	2.004	0.57(0.48)	0.85	8.9	6.00
3	11.98	13.63	1.956	0.57(0.48)	0.85	9.0	3.00
4	11.13	15.11	1.819	0.57(0.48)	0.85	9.2	1.00

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END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

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(909) 793-2257

FILE NAME: 0193HPB2.DAT
TIME/DATE OF STUDY: 14:46 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 353.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.559$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.071

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.41	0.57	0.850	69	12.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 2.02

TOTAL AREA(ACRES) = 1.41 PEAK FLOW RATE(CFS) = 2.02

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7029.00 DOWNSTREAM(Feet) = 7008.00

FLOW LENGTH(Feet) = 69.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 2.3 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 15.12

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 2.02

PIPE TRAVEL TIME(MIN.) = 0.08 $T_c(MIN.) = 12.64$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 422.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 12.64$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.062

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.06	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.06 SUBAREA RUNOFF(CFS) = 0.09

EFFECTIVE AREA(ACRES) = 1.47 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 2.09

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 12.64$

EFFECTIVE AREA(ACRES) = 1.47 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 2.09

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 360.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.708$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.054

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.)
PUBLIC PARK	C	1.62	0.57	0.850	69	12.71

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 2.29

TOTAL AREA(ACRES) = 1.62 PEAK FLOW RATE(CFS) = 2.29

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7029.00 DOWNSTREAM(Feet) = 7010.00

FLOW LENGTH(Feet) = 281.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.6 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 9.25

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 2.29

PIPE TRAVEL TIME(MIN.) = 0.51 $T_c(MIN.) = 13.21$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 641.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 13.21$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.999

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
PUBLIC PARK	C	0.13	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.13 SUBAREA RUNOFF(CFS) = 0.18

EFFECTIVE AREA(ACRES) = 1.75 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 1.8 PEAK FLOW RATE(CFS) = 2.39

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.8 $T_c(MIN.) = 13.21$

EFFECTIVE AREA(ACRES) = 1.75 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 2.39

END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HPD2.DAT
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 409.00
ELEVATION DATA: UPSTREAM(FEET) = 7062.00 DOWNSTREAM(FEET) = 7037.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.363$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.544

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	0.36	0.57	0.850	69	9.36

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 0.67

TOTAL AREA(ACRES) = 0.36 PEAK FLOW RATE(CFS) = 0.67

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.4 $T_c(MIN.) = 9.36$

EFFECTIVE AREA(ACRES) = 0.36 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 0.67

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END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 581.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.00 DOWNSTREAM(FEET) = 7028.80

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.614$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.497

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	1.38	0.57	0.100	69	9.61

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$

SUBAREA RUNOFF(CFS) = 3.03

TOTAL AREA(ACRES) = 1.38 PEAK FLOW RATE(CFS) = 3.03

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7028.80 DOWNSTREAM(FEET) = 7027.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 224.00 CHANNEL SLOPE = 0.0080

CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 2.000

MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 2.00

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.195

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.57	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.47

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.92

AVERAGE FLOW DEPTH(FEET) = 0.46 TRAVEL TIME(MIN.) = 1.94

$T_c(MIN.) = 11.56$

SUBAREA AREA(ACRES) = 0.57 SUBAREA RUNOFF(CFS) = 0.88

EFFECTIVE AREA(ACRES) = 1.95 AREA-AVERAGED $F_m(INCH/HR) = 0.18$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.32$

TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 3.54

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.47 FLOW VELOCITY(FEET/SEC.) = 1.92

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 805.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.0 $T_c(MIN.) = 11.56$

EFFECTIVE AREA(ACRES) = 1.95 AREA-AVERAGED $F_m(INCH/HR) = 0.18$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.319$

PEAK FLOW RATE(CFS) = 3.54

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 406.00
ELEVATION DATA: UPSTREAM(FEET) = 7043.20 DOWNSTREAM(FEET) = 7024.10

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 6.191$
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 3.398
 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	C	0.27	0.57	0.100	69	6.19
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.23	0.43	1.000	77	14.38

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.45$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.514$
 SUBAREA RUNOFF(CFS) = 1.43
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 1.43

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7024.10 DOWNSTREAM(FEET) = 7022.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 177.00 CHANNEL SLOPE = 0.0119
 CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 2.000
 MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 2.00
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.891
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
PUBLIC PARK	C	0.57	0.57	0.850	69

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.05
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.84
 AVERAGE FLOW DEPTH(FEET) = 0.31 TRAVEL TIME(MIN.) = 1.61
 $T_c(MIN.) = 7.80$
 SUBAREA AREA(ACRES) = 0.57 SUBAREA RUNOFF(CFS) = 1.24
 EFFECTIVE AREA(ACRES) = 1.07 AREA-AVERAGED $F_m(INCH/HR) = 0.36$
 AREA-AVERAGED $F_p(INCH/HR) = 0.53$ AREA-AVERAGED $A_p = 0.69$
 TOTAL AREA(ACRES) = 1.1 PEAK FLOW RATE(CFS) = 2.43

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34 FLOW VELOCITY(FEET/SEC.) = 1.96
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 583.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.1 $T_c(MIN.) = 7.80$
 EFFECTIVE AREA(ACRES) = 1.07 AREA-AVERAGED $F_m(INCH/HR) = 0.36$
 AREA-AVERAGED $F_p(INCH/HR) = 0.53$ AREA-AVERAGED $A_p = 0.693$
 PEAK FLOW RATE(CFS) = 2.43

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

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FILE NAME: 0193HPG2.DAT
TIME/DATE OF STUDY: 15:12 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 990.00
ELEVATION DATA: UPSTREAM(FEET) = 7044.70 DOWNSTREAM(FEET) = 7012.40

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.515$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.515

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	C	0.40	0.57	0.100	69	9.52
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.11	0.43	1.000	77	22.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.44$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.762$

SUBAREA RUNOFF(CFS) = 2.96

TOTAL AREA(ACRES) = 1.51 PEAK FLOW RATE(CFS) = 2.96

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 9.52$

EFFECTIVE AREA(ACRES) = 1.51 AREA-AVERAGED $F_m(INCH/HR) = 0.33$

AREA-AVERAGED $F_p(INCH/HR) = 0.44$ AREA-AVERAGED $A_p = 0.762$

PEAK FLOW RATE(CFS) = 2.96

=====

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END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HPH2.DAT
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.6930

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 266.00
ELEVATION DATA: UPSTREAM(FEET) = 7019.00 DOWNSTREAM(FEET) = 7005.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 5.112$

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 3.885

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	0.13	0.57	0.100	69	5.11
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.11	0.43	1.000	77	11.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.45$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.512$

SUBAREA RUNOFF(CFS) = 0.79

TOTAL AREA(ACRES) = 0.24 PEAK FLOW RATE(CFS) = 0.79

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.2 $T_c(MIN.) = 5.11$

EFFECTIVE AREA(ACRES) = 0.24 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.45$ AREA-AVERAGED $A_p = 0.512$

PEAK FLOW RATE(CFS) = 0.79

=====

=====

END OF RATIONAL METHOD ANALYSIS

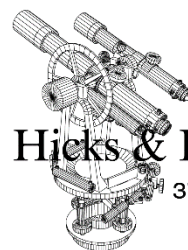
San Bernardino County

Hydrology & Hydraulics

Preliminary Report

PROPOSED HYDROLOGY

10-YEAR RUNOFF



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FILE NAME: 0193HPAT.DAT
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7031.50

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 13.199$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.464

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.)
PUBLIC PARK	C	1.64	0.57	0.850	69	13.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 4.40

TOTAL AREA(ACRES) = 1.64 PEAK FLOW RATE(CFS) = 4.40

FLOW PROCESS FROM NODE 2.00 TO NODE 4.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7028.50 DOWNSTREAM(Feet) = 7016.00

FLOW LENGTH(Feet) = 534.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.5 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 7.64

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 4.40

PIPE TRAVEL TIME(MIN.) = 1.16 $T_c(MIN.) = 14.36$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 934.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 14.36$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.264

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
PUBLIC PARK	C	0.48	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.48 SUBAREA RUNOFF(CFS) = 1.20

EFFECTIVE AREA(ACRES) = 2.12 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 2.1 PEAK FLOW RATE(CFS) = 5.31

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7016.00 DOWNSTREAM(Feet) = 7012.50

FLOW LENGTH(Feet) = 28.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.70
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 5.31
 PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 14.40
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 962.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.40
 RAINFALL INTENSITY(INCH/HR) = 3.26
 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 2.12
 TOTAL STREAM AREA(ACRES) = 2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.31

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 375.00
 ELEVATION DATA: UPSTREAM(FEET) = 7019.00 DOWNSTREAM(FEET) = 7015.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.169
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.469
 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.)
PUBLIC PARK	C	1.46	0.57	0.850	69	13.17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF(CFS) = 3.93
 TOTAL AREA(ACRES) = 1.46 PEAK FLOW RATE(CFS) = 3.93

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 13.17
 RAINFALL INTENSITY(INCH/HR) = 3.47

AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 1.46
 TOTAL STREAM AREA(ACRES) = 1.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.93

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.31	14.40	3.259	0.57(0.48)	0.85	2.1	1.00
2	3.93	13.17	3.469	0.57(0.48)	0.85	1.5	3.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.15	13.17	3.469	0.57(0.48)	0.85	3.4	3.00
2	8.96	14.40	3.259	0.57(0.48)	0.85	3.6	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 9.15 Tc(MIN.) = 13.17
 EFFECTIVE AREA(ACRES) = 3.40 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 3.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 962.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 8.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 7012.50 DOWNSTREAM(FEET) = 7004.50

FLOW LENGTH(FEET) = 48.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.7 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 19.01

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 9.15

PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 13.21

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 8.00 = 1010.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 8.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MIN.) = 13.21

RAINFALL INTENSITY(INCH/HR) = 3.46

AREA-AVERAGED Fm(INCH/HR) = 0.48

AREA-AVERAGED Fp(INCH/HR) = 0.57
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 3.40
 TOTAL STREAM AREA(ACRES) = 3.58
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.15

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 346.00

ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 12.409

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.616

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.50	0.57	0.850	69	12.41

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850

SUBAREA RUNOFF(CFS) = 4.23

TOTAL AREA(ACRES) = 1.50 PEAK FLOW RATE(CFS) = 4.23

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7029.00 DOWNSTREAM(FEET) = 7004.50

FLOW LENGTH(FEET) = 225.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.3 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 13.09

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 4.23

PIPE TRAVEL TIME(MIN.) = 0.29 T_c (MIN.) = 12.70

LONGEST FLOWPATH FROM NODE 6.00 TO NODE 8.00 = 571.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 8.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 12.70

RAINFALL INTENSITY(INCH/HR) = 3.56

AREA-AVERAGED Fm(INCH/HR) = 0.48

AREA-AVERAGED Fp(INCH/HR) = 0.57

AREA-AVERAGED $A_p = 0.85$
 EFFECTIVE STREAM AREA(ACRES) = 1.50
 TOTAL STREAM AREA(ACRES) = 1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.23

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	9.15	13.21	3.461	0.57(0.48)	0.85	3.4	3.00
1	8.96	14.44	3.253	0.57(0.48)	0.85	3.6	1.00
2	4.23	12.70	3.559	0.57(0.48)	0.85	1.5	6.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	13.31	12.70	3.559	0.57(0.48)	0.85	4.8	6.00
2	13.25	13.21	3.461	0.57(0.48)	0.85	4.9	3.00
3	12.77	14.44	3.253	0.57(0.48)	0.85	5.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 13.31 Tc(MIN.) = 12.70
 EFFECTIVE AREA(ACRES) = 4.77 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED $A_p = 0.85$
 TOTAL AREA(ACRES) = 5.1
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 8.00 = 1010.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 7004.50 DOWNSTREAM(FEET) = 6994.40
 CHANNEL LENGTH THRU SUBAREA(FEET) = 175.00 CHANNEL SLOPE = 0.0577
 CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 3.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 13.31
 FLOW VELOCITY(FEET/SEC.) = 10.71 FLOW DEPTH(FEET) = 0.64
 TRAVEL TIME(MIN.) = 0.27 Tc(MIN.) = 12.97
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 12.97
 RAINFALL INTENSITY(INCH/HR) = 3.51
 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57

AREA-AVERAGED $A_p = 0.85$
 EFFECTIVE STREAM AREA(ACRES) = 4.77
 TOTAL STREAM AREA(ACRES) = 5.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.31

FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 624.00

ELEVATION DATA: UPSTREAM(FEET) = 7043.10 DOWNSTREAM(FEET) = 7015.50

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 11.827

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.740

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.)
PUBLIC PARK	C	2.05	0.57	0.850	69	11.83

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.57

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.850

SUBAREA RUNOFF(CFS) = 6.01

TOTAL AREA(ACRES) = 2.05 PEAK FLOW RATE(CFS) = 6.01

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7012.50 DOWNSTREAM(FEET) = 7002.50

FLOW LENGTH(FEET) = 372.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 8.74

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 6.01

PIPE TRAVEL TIME(MIN.) = 0.71 T_c (MIN.) = 12.54

LONGEST FLOWPATH FROM NODE 9.00 TO NODE 11.00 = 996.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7002.50 DOWNSTREAM(FEET) = 6994.40

CHANNEL LENGTH THRU SUBAREA(FEET) = 98.00 CHANNEL SLOPE = 0.0827

CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 3.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00

CHANNEL FLOW THRU SUBAREA(CFS) = 6.01

FLOW VELOCITY(FEET/SEC.) = 10.10 FLOW DEPTH(FEET) = 0.45

TRAVEL TIME(MIN.) = 0.16 T_c (MIN.) = 12.70

LONGEST FLOWPATH FROM NODE 9.00 TO NODE 12.00 = 1094.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 12.70
RAINFALL INTENSITY(INCH/HR) = 3.56
AREA-AVERAGED Fm(INCH/HR) = 0.48
AREA-AVERAGED Fp(INCH/HR) = 0.57
AREA-AVERAGED Ap = 0.85
EFFECTIVE STREAM AREA(ACRES) = 2.05
TOTAL STREAM AREA(ACRES) = 2.05
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.01

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	13.31	12.97	3.507	0.57(0.48)	0.85	4.8	6.00
1	13.25	13.48	3.413	0.57(0.48)	0.85	4.9	3.00
1	12.77	14.71	3.210	0.57(0.48)	0.85	5.1	1.00
2	6.01	12.70	3.558	0.57(0.48)	0.85	2.0	9.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	19.27	12.70	3.558	0.57(0.48)	0.85	6.7	9.00
2	19.23	12.97	3.507	0.57(0.48)	0.85	6.8	6.00
3	18.98	13.48	3.413	0.57(0.48)	0.85	6.9	3.00
4	18.11	14.71	3.210	0.57(0.48)	0.85	7.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 19.27 Tc(MIN.) = 12.70
EFFECTIVE AREA(ACRES) = 6.72 AREA-AVERAGED Fm(INCH/HR) = 0.48
AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
TOTAL AREA(ACRES) = 7.1
LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 12.70
* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.558
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN

PUBLIC PARK C 0.45 0.57 0.850 69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.45 SUBAREA RUNOFF(CFS) = 1.25
 EFFECTIVE AREA(ACRES) = 7.17 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 7.6 PEAK FLOW RATE(CFS) = 19.85

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 6994.40 DOWNSTREAM(FEET) = 6940.00
 FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 32.59
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 19.85
 PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 12.77
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 13.00 = 1318.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 12.77
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.545
 SUBAREA LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 PUBLIC PARK C 1.66 0.57 0.850 69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 1.66 SUBAREA RUNOFF(CFS) = 4.58
 EFFECTIVE AREA(ACRES) = 8.83 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 9.2 PEAK FLOW RATE(CFS) = 24.34

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 9.2 TC(MIN.) = 12.77
 EFFECTIVE AREA(ACRES) = 8.83 AREA-AVERAGED Fm(INCH/HR) = 0.48
 AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.850
 PEAK FLOW RATE(CFS) = 24.34

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	24.34	12.77	3.545	0.57(0.48)	0.85	8.8	9.00
2	24.20	13.04	3.494	0.57(0.48)	0.85	8.9	6.00
3	23.80	13.55	3.401	0.57(0.48)	0.85	9.1	3.00
4	22.61	14.78	3.200	0.57(0.48)	0.85	9.2	1.00

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END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0193HPBT.DAT
TIME/DATE OF STUDY: 15:18 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 353.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.559$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.586

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.41	0.57	0.850	69	12.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850

SUBAREA RUNOFF(CFS) = 3.94

TOTAL AREA(ACRES) = 1.41 PEAK FLOW RATE(CFS) = 3.94

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7029.00 DOWNSTREAM(FEET) = 7008.00

FLOW LENGTH(FEET) = 69.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 18.44

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 3.94

PIPE TRAVEL TIME(MIN.) = 0.06 $T_c(MIN.) = 12.62$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 422.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 12.62$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.574

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.06	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.57

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850

SUBAREA AREA(ACRES) = 0.06 SUBAREA RUNOFF(CFS) = 0.17

EFFECTIVE AREA(ACRES) = 1.47 AREA-AVERAGED Fm(INCH/HR) = 0.48

AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.85

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 4.09

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 12.62$

EFFECTIVE AREA(ACRES) = 1.47 AREA-AVERAGED Fm(INCH/HR) = 0.48

AREA-AVERAGED Fp(INCH/HR) = 0.57 AREA-AVERAGED Ap = 0.850

PEAK FLOW RATE(CFS) = 4.09

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Ver. 22.0 Release Date: 07/01/2015 License ID 1302

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FILE NAME: 0193HPCT.DAT
TIME/DATE OF STUDY: 15:19 02/15/2021
=====

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 360.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.708$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.557

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.)
PUBLIC PARK	C	1.62	0.57	0.850	69	12.71

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 4.48

TOTAL AREA(ACRES) = 1.62 PEAK FLOW RATE(CFS) = 4.48

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7029.00 DOWNSTREAM(FEET) = 7010.00

FLOW LENGTH(FEET) = 281.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 5.0 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 11.24

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 4.48

PIPE TRAVEL TIME(MIN.) = 0.42 $T_c(MIN.) = 13.12$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 641.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 13.12$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.477

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
PUBLIC PARK	C	0.13	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.13 SUBAREA RUNOFF(CFS) = 0.35

EFFECTIVE AREA(ACRES) = 1.75 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 1.8 PEAK FLOW RATE(CFS) = 4.72

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.8 $T_c(MIN.) = 13.12$

EFFECTIVE AREA(ACRES) = 1.75 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 4.72

END OF RATIONAL METHOD ANALYSIS

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FILE NAME: 0193HPDT.DAT
TIME/DATE OF STUDY: 15:19 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 409.00
ELEVATION DATA: UPSTREAM(FEET) = 7062.00 DOWNSTREAM(FEET) = 7037.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.363$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 4.405

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	0.36	0.57	0.850	69	9.36

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 1.27

TOTAL AREA(ACRES) = 0.36 PEAK FLOW RATE(CFS) = 1.27

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.4 $T_c(MIN.) = 9.36$

EFFECTIVE AREA(ACRES) = 0.36 AREA-AVERAGED $F_m(INCH/HR) = 0.48$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 1.27

=====

=====

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 581.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.00 DOWNSTREAM(FEET) = 7028.80

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.614$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 4.324

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	1.38	0.57	0.100	69	9.61

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$

SUBAREA RUNOFF(CFS) = 5.30

TOTAL AREA(ACRES) = 1.38 PEAK FLOW RATE(CFS) = 5.30

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7028.80 DOWNSTREAM(FEET) = 7027.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 224.00 CHANNEL SLOPE = 0.0080

CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 2.000

MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 2.00

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 3.871

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.57	0.57	0.850	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.17

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.27

AVERAGE FLOW DEPTH(FEET) = 0.64 TRAVEL TIME(MIN.) = 1.64

$T_c(MIN.) = 11.26$

SUBAREA AREA(ACRES) = 0.57 SUBAREA RUNOFF(CFS) = 1.74

EFFECTIVE AREA(ACRES) = 1.95 AREA-AVERAGED $F_m(INCH/HR) = 0.18$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.32$

TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 6.48

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.65 FLOW VELOCITY(FEET/SEC.) = 2.31

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 805.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.0 $T_c(MIN.) = 11.26$

EFFECTIVE AREA(ACRES) = 1.95 AREA-AVERAGED $F_m(INCH/HR) = 0.18$

AREA-AVERAGED $F_p(INCH/HR) = 0.57$ AREA-AVERAGED $A_p = 0.319$

PEAK FLOW RATE(CFS) = 6.48

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 406.00
ELEVATION DATA: UPSTREAM(FEET) = 7043.20 DOWNSTREAM(FEET) = 7024.10

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION CHANGE)]^{**0.20}$
 SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 6.191$
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 5.884
 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	C	0.27	0.57	0.100	69	6.19
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.23	0.43	1.000	77	14.38

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.45$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.514$
 SUBAREA RUNOFF(CFS) = 2.54
 TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 2.54

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7024.10 DOWNSTREAM(FEET) = 7022.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 177.00 CHANNEL SLOPE = 0.0119
 CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 2.000
 MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 2.00
 * 10 YEAR RAINFALL INTENSITY(INCH/HR) = 5.141
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
PUBLIC PARK	C	0.57	0.57	0.850	69

 SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.57$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.74
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.24
 AVERAGE FLOW DEPTH(FEET) = 0.43 TRAVEL TIME(MIN.) = 1.32
 $T_c(MIN.) = 7.51$
 SUBAREA AREA(ACRES) = 0.57 SUBAREA RUNOFF(CFS) = 2.39
 EFFECTIVE AREA(ACRES) = 1.07 AREA-AVERAGED $F_m(INCH/HR) = 0.36$
 AREA-AVERAGED $F_p(INCH/HR) = 0.53$ AREA-AVERAGED $A_p = 0.69$
 TOTAL AREA(ACRES) = 1.1 PEAK FLOW RATE(CFS) = 4.60

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48 FLOW VELOCITY(FEET/SEC.) = 2.40
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 583.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.1 $T_c(MIN.) = 7.51$
 EFFECTIVE AREA(ACRES) = 1.07 AREA-AVERAGED $F_m(INCH/HR) = 0.36$
 AREA-AVERAGED $F_p(INCH/HR) = 0.53$ AREA-AVERAGED $A_p = 0.693$
 PEAK FLOW RATE(CFS) = 4.60

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 990.00
ELEVATION DATA: UPSTREAM(FEET) = 7044.70 DOWNSTREAM(FEET) = 7012.40

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.515$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 4.355

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	C	0.40	0.57	0.100	69	9.52
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.11	0.43	1.000	77	22.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.44$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.762$

SUBAREA RUNOFF(CFS) = 5.46

TOTAL AREA(ACRES) = 1.51 PEAK FLOW RATE(CFS) = 5.46

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 9.52$

EFFECTIVE AREA(ACRES) = 1.51 AREA-AVERAGED $F_m(INCH/HR) = 0.33$

AREA-AVERAGED $F_p(INCH/HR) = 0.44$ AREA-AVERAGED $A_p = 0.762$

PEAK FLOW RATE(CFS) = 5.46

=====

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END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2000

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 266.00
ELEVATION DATA: UPSTREAM(FEET) = 7019.00 DOWNSTREAM(FEET) = 7005.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 5.112$

* 10 YEAR RAINFALL INTENSITY(INCH/HR) = 6.728

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	0.13	0.57	0.100	69	5.11
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.11	0.43	1.000	77	11.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.45$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.512$

SUBAREA RUNOFF(CFS) = 1.40

TOTAL AREA(ACRES) = 0.24 PEAK FLOW RATE(CFS) = 1.40

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.2 $T_c(MIN.) = 5.11$

EFFECTIVE AREA(ACRES) = 0.24 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.45$ AREA-AVERAGED $A_p = 0.512$

PEAK FLOW RATE(CFS) = 1.40

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END OF RATIONAL METHOD ANALYSIS

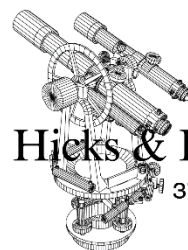
San Bernardino County

Hydrology & Hydraulics

Preliminary Report

PROPOSED HYDROLOGY

100-YEAR RUNOFF



Hicks & Hartwick, Inc.

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7031.50

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 13.199$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.350

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.64	0.27	0.850	86	13.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 9.03

TOTAL AREA(ACRES) = 1.64 PEAK FLOW RATE(CFS) = 9.03

FLOW PROCESS FROM NODE 2.00 TO NODE 4.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7028.50 DOWNSTREAM(Feet) = 7016.00

FLOW LENGTH(Feet) = 534.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.8 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 9.21

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 9.03

PIPE TRAVEL TIME(MIN.) = 0.97 $T_c(MIN.) = 14.17$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 934.00 FEET.

FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 14.17$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.043

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.48	0.27	0.850	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.48 SUBAREA RUNOFF(CFS) = 2.51

EFFECTIVE AREA(ACRES) = 2.12 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 2.1 PEAK FLOW RATE(CFS) = 11.09

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7016.00 DOWNSTREAM(Feet) = 7012.50

FLOW LENGTH(Feet) = 28.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 18.07
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 11.09
 PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 14.19
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 962.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 14.19
 RAINFALL INTENSITY(INCH/HR) = 6.04
 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 2.12
 TOTAL STREAM AREA(ACRES) = 2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.09

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 375.00
 ELEVATION DATA: UPSTREAM(FEET) = 7019.00 DOWNSTREAM(FEET) = 7015.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 13.169
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.360
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
PUBLIC PARK	C	1.46	0.27	0.850	86	13.17

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF(CFS) = 8.05
 TOTAL AREA(ACRES) = 1.46 PEAK FLOW RATE(CFS) = 8.05

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 13.17
 RAINFALL INTENSITY(INCH/HR) = 6.36

AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 1.46
 TOTAL STREAM AREA(ACRES) = 1.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.05

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	11.09	14.19	6.036	0.27(0.23)	0.85	2.1	1.00
2	8.05	13.17	6.360	0.27(0.23)	0.85	1.5	3.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.92	13.17	6.360	0.27(0.23)	0.85	3.4	3.00
2	18.72	14.19	6.036	0.27(0.23)	0.85	3.6	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 18.92 Tc(MIN.) = 13.17
 EFFECTIVE AREA(ACRES) = 3.43 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 3.6
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 5.00 = 962.00 FEET.

FLOW PROCESS FROM NODE 5.00 TO NODE 8.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 7012.50 DOWNSTREAM(Feet) = 7004.50

FLOW LENGTH(Feet) = 48.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 8.5 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 23.14

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 18.92

PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 13.20

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 8.00 = 1010.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 8.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MIN.) = 13.20

RAINFALL INTENSITY(INCH/HR) = 6.35

AREA-AVERAGED Fm(INCH/HR) = 0.23

AREA-AVERAGED Fp(INCH/HR) = 0.27
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 3.43
 TOTAL STREAM AREA(ACRES) = 3.58
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 18.92

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 346.00

ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 12.409

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.630

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.50	0.27	0.850	86	12.41

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850

SUBAREA RUNOFF(CFS) = 8.64

TOTAL AREA(ACRES) = 1.50 PEAK FLOW RATE(CFS) = 8.64

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7029.00 DOWNSTREAM(FEET) = 7004.50

FLOW LENGTH(FEET) = 225.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 16.04

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 8.64

PIPE TRAVEL TIME(MIN.) = 0.23 T_c (MIN.) = 12.64

LONGEST FLOWPATH FROM NODE 6.00 TO NODE 8.00 = 571.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 8.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 12.64

RAINFALL INTENSITY(INCH/HR) = 6.54

AREA-AVERAGED Fm(INCH/HR) = 0.23

AREA-AVERAGED Fp(INCH/HR) = 0.27

AREA-AVERAGED $A_p = 0.85$
 EFFECTIVE STREAM AREA(ACRES) = 1.50
 TOTAL STREAM AREA(ACRES) = 1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.64

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	18.92	13.20	6.348	0.27(0.23)	0.85	3.4	3.00
1	18.72	14.23	6.025	0.27(0.23)	0.85	3.6	1.00
2	8.64	12.64	6.544	0.27(0.23)	0.85	1.5	6.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	A_p	Ae (ACRES)	HEADWATER NODE
1	27.33	12.64	6.544	0.27(0.23)	0.85	4.8	6.00
2	27.29	13.20	6.348	0.27(0.23)	0.85	4.9	3.00
3	26.65	14.23	6.025	0.27(0.23)	0.85	5.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 27.33 Tc(MIN.) = 12.64
 EFFECTIVE AREA(ACRES) = 4.78 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED $A_p = 0.85$
 TOTAL AREA(ACRES) = 5.1
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 8.00 = 1010.00 FEET.

FLOW PROCESS FROM NODE 8.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 7004.50 DOWNSTREAM(FEET) = 6994.40
 CHANNEL LENGTH THRU SUBAREA(FEET) = 175.00 CHANNEL SLOPE = 0.0577
 CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 3.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 27.33
 FLOW VELOCITY(FEET/SEC.) = 12.85 FLOW DEPTH(FEET) = 0.84
 TRAVEL TIME(MIN.) = 0.23 Tc(MIN.) = 12.87
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 12.87
 RAINFALL INTENSITY(INCH/HR) = 6.46
 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27

AREA-AVERAGED $A_p = 0.85$
EFFECTIVE STREAM AREA(ACRES) = 4.78
TOTAL STREAM AREA(ACRES) = 5.08
PEAK FLOW RATE(CFS) AT CONFLUENCE = 27.33

FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 624.00

ELEVATION DATA: UPSTREAM(FEET) = 7043.10 DOWNSTREAM(FEET) = 7015.50

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 11.827

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.857

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	2.05	0.27	0.850	86	11.83

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.27

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.850

SUBAREA RUNOFF(CFS) = 12.22

TOTAL AREA(ACRES) = 2.05 PEAK FLOW RATE(CFS) = 12.22

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7012.50 DOWNSTREAM(FEET) = 7002.50

FLOW LENGTH(FEET) = 372.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 10.40

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 12.22

PIPE TRAVEL TIME(MIN.) = 0.60 T_c (MIN.) = 12.42

LONGEST FLOWPATH FROM NODE 9.00 TO NODE 11.00 = 996.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7002.50 DOWNSTREAM(FEET) = 6994.40

CHANNEL LENGTH THRU SUBAREA(FEET) = 98.00 CHANNEL SLOPE = 0.0827

CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 3.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00

CHANNEL FLOW THRU SUBAREA(CFS) = 12.22

FLOW VELOCITY(FEET/SEC.) = 12.00 FLOW DEPTH(FEET) = 0.58

TRAVEL TIME(MIN.) = 0.14 T_c (MIN.) = 12.56

LONGEST FLOWPATH FROM NODE 9.00 TO NODE 12.00 = 1094.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 12.56
 RAINFALL INTENSITY(INCH/HR) = 6.57
 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27
 AREA-AVERAGED Ap = 0.85
 EFFECTIVE STREAM AREA(ACRES) = 2.05
 TOTAL STREAM AREA(ACRES) = 2.05
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 12.22

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.33	12.87	6.463	0.27(0.23)	0.85	4.8	6.00
1	27.29	13.43	6.273	0.27(0.23)	0.85	4.9	3.00
1	26.65	14.45	5.958	0.27(0.23)	0.85	5.1	1.00
2	12.22	12.56	6.574	0.27(0.23)	0.85	2.0	9.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	39.37	12.56	6.574	0.27(0.23)	0.85	6.7	9.00
2	39.34	12.87	6.463	0.27(0.23)	0.85	6.8	6.00
3	38.93	13.43	6.273	0.27(0.23)	0.85	7.0	3.00
4	37.68	14.45	5.958	0.27(0.23)	0.85	7.1	1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 39.37 Tc(MIN.) = 12.56
 EFFECTIVE AREA(ACRES) = 6.72 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 7.1
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 12.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 12.56
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.574
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.45	0.27	0.850	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.45 SUBAREA RUNOFF(CFS) = 2.57
 EFFECTIVE AREA(ACRES) = 7.17 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 7.6 PEAK FLOW RATE(CFS) = 40.91

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 6994.40 DOWNSTREAM(FEET) = 6940.00
 FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 39.24
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 40.91
 PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 12.62
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 13.00 = 1318.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 12.62
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.554
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	1.66	0.27	0.850	86

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 1.66 SUBAREA RUNOFF(CFS) = 9.45
 EFFECTIVE AREA(ACRES) = 8.83 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 9.2 PEAK FLOW RATE(CFS) = 50.22

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 9.2 TC(MIN.) = 12.62
 EFFECTIVE AREA(ACRES) = 8.83 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.850
 PEAK FLOW RATE(CFS) = 50.22

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	50.22	12.62	6.554	0.27(0.23)	0.85	8.8	9.00
2	49.99	12.93	6.443	0.27(0.23)	0.85	8.9	6.00
3	49.26	13.49	6.254	0.27(0.23)	0.85	9.1	3.00
4	47.49	14.51	5.942	0.27(0.23)	0.85	9.2	1.00

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

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(909) 793-2257

FILE NAME: 0193HPBH.DAT
TIME/DATE OF STUDY: 15:24 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 353.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.559$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.574

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.41	0.27	0.850	86	12.56

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 8.05

TOTAL AREA(ACRES) = 1.41 PEAK FLOW RATE(CFS) = 8.05

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7029.00 DOWNSTREAM(Feet) = 7008.00

FLOW LENGTH(Feet) = 69.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.6 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 22.72

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 8.05

PIPE TRAVEL TIME(MIN.) = 0.05 $T_c(MIN.) = 12.61$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 422.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 12.61$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.556

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.06	0.27	0.850	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.06 SUBAREA RUNOFF(CFS) = 0.34

EFFECTIVE AREA(ACRES) = 1.47 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 8.37

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 12.61$

EFFECTIVE AREA(ACRES) = 1.47 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 8.37

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 360.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.70 DOWNSTREAM(FEET) = 7032.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 12.708$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.520

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	1.62	0.27	0.850	86	12.71

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 9.17

TOTAL AREA(ACRES) = 1.62 PEAK FLOW RATE(CFS) = 9.17

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(Feet) = 7029.00 DOWNSTREAM(Feet) = 7010.00

FLOW LENGTH(Feet) = 281.00 MANNING'S N = 0.013

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000

DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.3 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 13.72

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 9.17

PIPE TRAVEL TIME(MIN.) = 0.34 $T_c(MIN.) = 13.05$

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 641.00 FEET.

FLOW PROCESS FROM NODE 3.00 TO NODE 3.00 IS CODE = 81

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

MAINLINE $T_c(MIN.) = 13.05$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.400

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.13	0.27	0.850	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA AREA(ACRES) = 0.13 SUBAREA RUNOFF(CFS) = 0.72

EFFECTIVE AREA(ACRES) = 1.75 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.85$

TOTAL AREA(ACRES) = 1.8 PEAK FLOW RATE(CFS) = 9.72

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.8 $T_c(MIN.) = 13.05$

EFFECTIVE AREA(ACRES) = 1.75 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 9.72

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 409.00
ELEVATION DATA: UPSTREAM(FEET) = 7062.00 DOWNSTREAM(FEET) = 7037.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.363$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 8.075

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	C	0.36	0.27	0.850	86	9.36

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

SUBAREA RUNOFF(CFS) = 2.54

TOTAL AREA(ACRES) = 0.36 PEAK FLOW RATE(CFS) = 2.54

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.4 $T_c(MIN.) = 9.36$

EFFECTIVE AREA(ACRES) = 0.36 AREA-AVERAGED $F_m(INCH/HR) = 0.23$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.850$

PEAK FLOW RATE(CFS) = 2.54

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END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 581.00
ELEVATION DATA: UPSTREAM(FEET) = 7035.00 DOWNSTREAM(FEET) = 7028.80

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.614$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 7.927

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	1.38	0.27	0.100	86	9.61

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$

SUBAREA RUNOFF(CFS) = 9.81

TOTAL AREA(ACRES) = 1.38 PEAK FLOW RATE(CFS) = 9.81

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7028.80 DOWNSTREAM(FEET) = 7027.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 224.00 CHANNEL SLOPE = 0.0080

CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 2.000

MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 2.00

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 7.224

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.57	0.27	0.850	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 11.61

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.74

AVERAGE FLOW DEPTH(FEET) = 0.89 TRAVEL TIME(MIN.) = 1.36

$T_c(MIN.) = 10.98$

SUBAREA AREA(ACRES) = 0.57 SUBAREA RUNOFF(CFS) = 3.59

EFFECTIVE AREA(ACRES) = 1.95 AREA-AVERAGED $F_m(INCH/HR) = 0.09$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.32$

TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 12.53

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.93 FLOW VELOCITY(FEET/SEC.) = 2.79

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 805.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.0 $T_c(MIN.) = 10.98$

EFFECTIVE AREA(ACRES) = 1.95 AREA-AVERAGED $F_m(INCH/HR) = 0.09$

AREA-AVERAGED $F_p(INCH/HR) = 0.27$ AREA-AVERAGED $A_p = 0.319$

PEAK FLOW RATE(CFS) = 12.53

END OF RATIONAL METHOD ANALYSIS

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 406.00
ELEVATION DATA: UPSTREAM(FEET) = 7043.20 DOWNSTREAM(FEET) = 7024.10

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 6.191$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 10.787

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	0.27	0.27	0.100	86	6.19
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.23	0.19	1.000	92	14.38

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.20$
SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.514$
SUBAREA RUNOFF(CFS) = 4.81
TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 4.81

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 7024.10 DOWNSTREAM(FEET) = 7022.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 177.00 CHANNEL SLOPE = 0.0119
CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 2.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 9.643

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	C	0.57	0.27	0.850	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.27$
SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.850$
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.23
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.74
AVERAGE FLOW DEPTH(FEET) = 0.62 TRAVEL TIME(MIN.) = 1.08
 $T_c(MIN.) = 7.27$
SUBAREA AREA(ACRES) = 0.57 SUBAREA RUNOFF(CFS) = 4.83
EFFECTIVE AREA(ACRES) = 1.07 AREA-AVERAGED $F_m(INCH/HR) = 0.17$
AREA-AVERAGED $F_p(INCH/HR) = 0.25$ AREA-AVERAGED $A_p = 0.69$
TOTAL AREA(ACRES) = 1.1 PEAK FLOW RATE(CFS) = 9.12

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.70 FLOW VELOCITY(FEET/SEC.) = 2.94

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 583.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.1 $T_c(MIN.) = 7.27$
EFFECTIVE AREA(ACRES) = 1.07 AREA-AVERAGED $F_m(INCH/HR) = 0.17$
AREA-AVERAGED $F_p(INCH/HR) = 0.25$ AREA-AVERAGED $A_p = 0.693$
PEAK FLOW RATE(CFS) = 9.12

END OF RATIONAL METHOD ANALYSIS

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Analysis prepared by:

Hicks & Hartwick, Inc.
37 East Olive Avenue, Suite C
Redlands, CA 92373
(909) 793-2257

FILE NAME: 0193HPGH.DAT
TIME/DATE OF STUDY: 15:27 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 990.00
ELEVATION DATA: UPSTREAM(FEET) = 7044.70 DOWNSTREAM(FEET) = 7012.40

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 9.515$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 7.984

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	0.40	0.27	0.100	86	9.52
NATURAL FAIR COVER "WOODLAND, GRASS"	C	1.11	0.19	1.000	92	22.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.19$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.762$

SUBAREA RUNOFF(CFS) = 10.65

TOTAL AREA(ACRES) = 1.51 PEAK FLOW RATE(CFS) = 10.65

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.5 $T_c(MIN.) = 9.52$

EFFECTIVE AREA(ACRES) = 1.51 AREA-AVERAGED $F_m(INCH/HR) = 0.15$

AREA-AVERAGED $F_p(INCH/HR) = 0.19$ AREA-AVERAGED $A_p = 0.762$

PEAK FLOW RATE(CFS) = 10.65

=====

=====

END OF RATIONAL METHOD ANALYSIS

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(909) 793-2257

FILE NAME: 0193HPHH.DAT
TIME/DATE OF STUDY: 15:27 02/15/2021
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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.7000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 2.2000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 266.00
ELEVATION DATA: UPSTREAM(FEET) = 7019.00 DOWNSTREAM(FEET) = 7005.00

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

SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 5.112$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 12.335

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	0.13	0.27	0.100	86	5.11
NATURAL FAIR COVER "WOODLAND, GRASS"	C	0.11	0.19	1.000	92	11.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.20$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.512$

SUBAREA RUNOFF(CFS) = 2.64

TOTAL AREA(ACRES) = 0.24 PEAK FLOW RATE(CFS) = 2.64

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.2 $T_c(MIN.) = 5.11$

EFFECTIVE AREA(ACRES) = 0.24 AREA-AVERAGED $F_m(INCH/HR) = 0.10$

AREA-AVERAGED $F_p(INCH/HR) = 0.20$ AREA-AVERAGED $A_p = 0.512$

PEAK FLOW RATE(CFS) = 2.64

=====

=====

END OF RATIONAL METHOD ANALYSIS

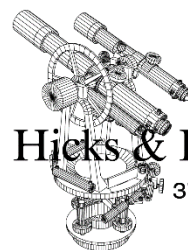
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SMALL AREA

UNIT HYDROGRAPH CALCULATIONS



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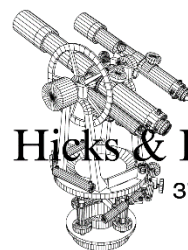
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SURFACE HYDRAULICS



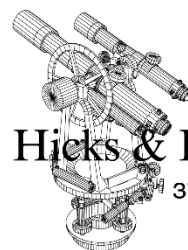
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CATCH BASIN INLET HYDRAULICS



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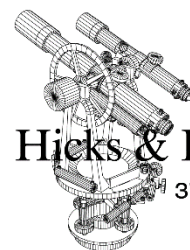
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STORM DRAIN HYDRAULICS



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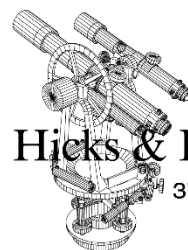
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HYDROLOGY MAPS



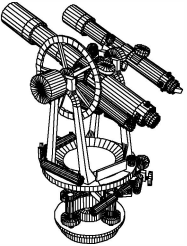
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MAPLE HILL FIELDS COMPLEX
Bear Valley Unified School
District Education Foundation
SAN BERNARDINO COUNTY
EXISTING HYDROLOGY

HYDROLOGIC DATA

SCS SOILS GROUP: C
INTENSITY-DURATION SLOPE: 0.70
2-YR/1-HR RAINFALL (AMC II): 0.693 in/hr
10-YR/1-HR RAINFALL (AMC II): 1.20 in/hr
100-YR/1-HR RAINFALL (AMC III): 2.20 in/hr



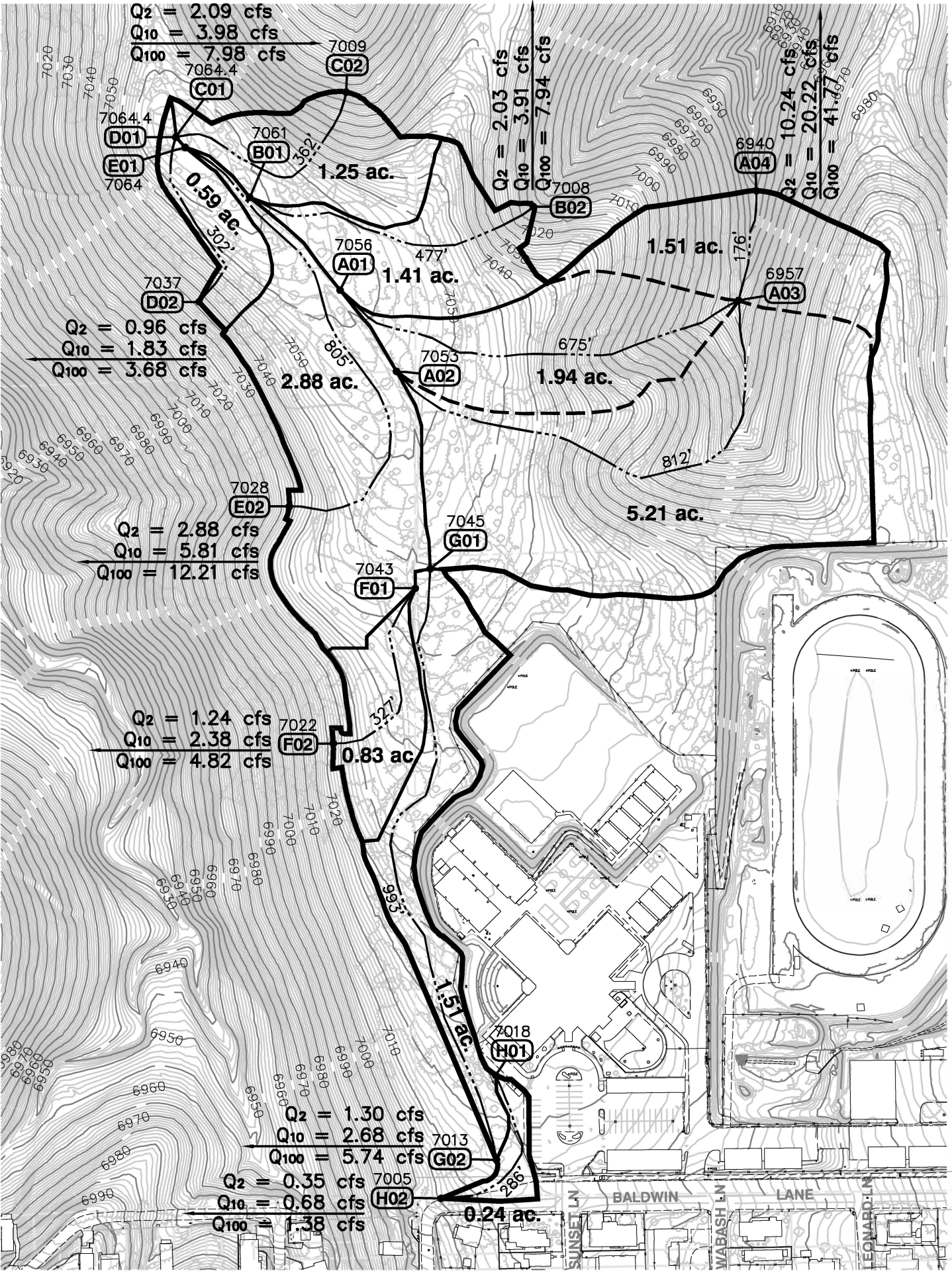
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37 East Olive Avenue
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Prepared: FEBRUARY 2021



SCALE: 1" = 200'



[illegible]

A circular professional engineer seal for Riley Clark. The outer ring contains the text "REGISTERED PROFESSIONAL ENGINEER" at the top and "STATE OF CALIFORNIA" at the bottom, separated by two stars. Inside the ring, the name "RILEY CLARK" is written in a large, bold, sans-serif font. Below the name, the text "No. C 40606" and "exp. 3/31/2021" are printed. At the bottom of the inner circle, the word "CIVIL" is written. A signature is written across the seal.



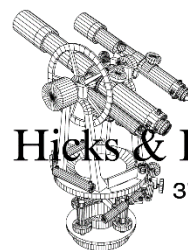
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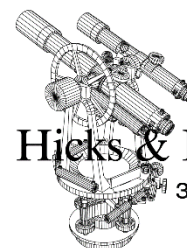
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PRECISE GRADING PLANS



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