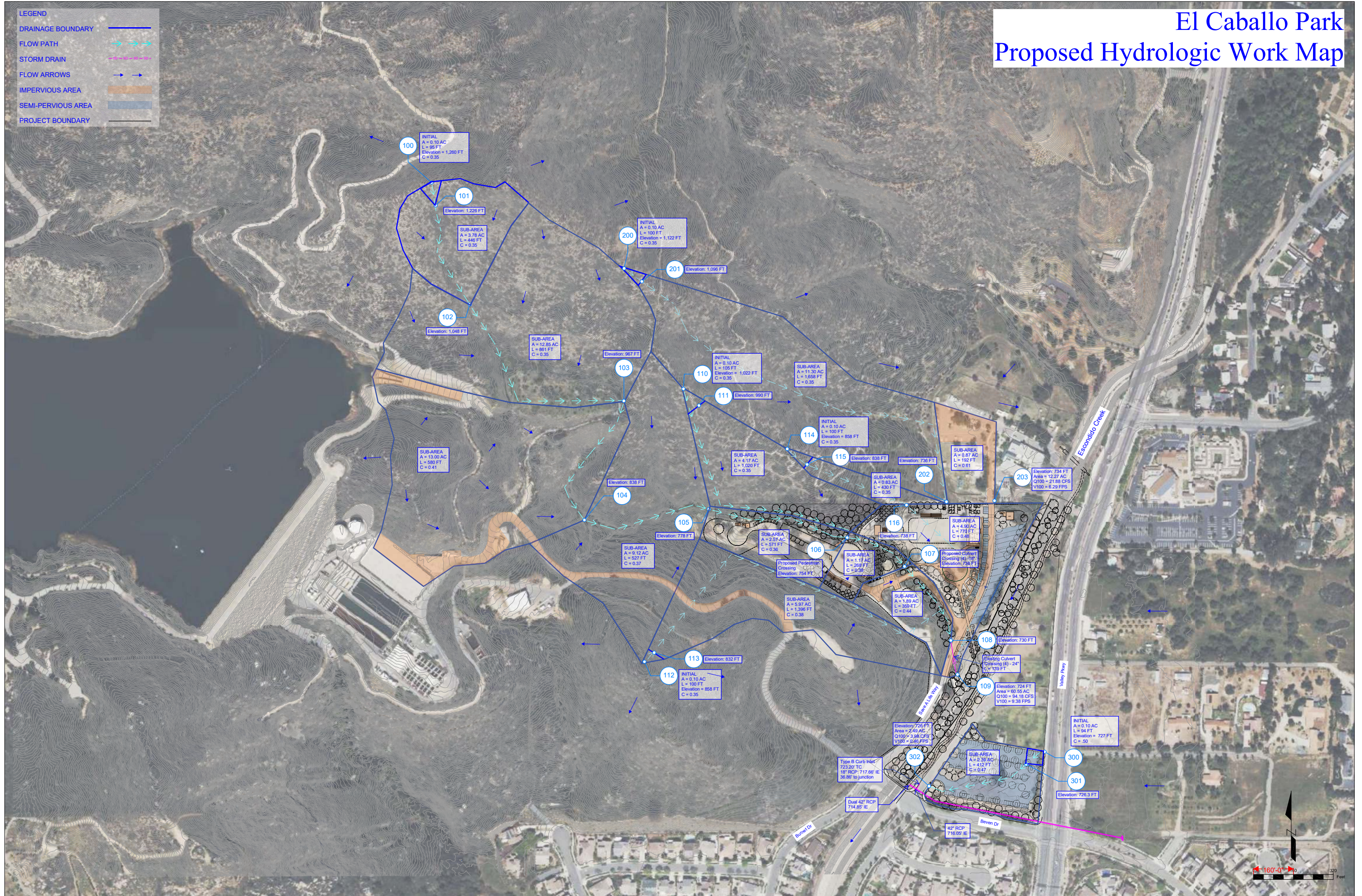


APPENDIX E
STORMWATER TECHNICAL MEMORANDUM
Part 2 of 3

El Caballo Park Proposed Hydrologic Work Map



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
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Ver. 23.0 Release Date: 07/01/2016 License ID 1264

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
* EL CABALLO PARK *
* PROPOSED CONDITIONS *
* 100 YEAR STORM *

FILE NAME: PRQ100.DAT
TIME/DATE OF STUDY: 10:24 08/07/2024

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.700
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

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

	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT	GUTTER-GEOMETRIES: WIDTH LIP HIKE	MANNING FACTOR
NO.	(FT)	(FT)		(FT)	(FT) (FT) (FT)	(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.*

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

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

=====

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

INITIAL SUBAREA FLOW-LENGTH(FEET) = 95.00

UPSTREAM ELEVATION(FEET) = 1260.00

DOWNSTREAM ELEVATION(FEET) = 1226.00

ELEVATION DIFFERENCE(FEET) = 34.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.108

WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.568

SUBAREA RUNOFF(CFS) = 0.30

TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.30

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 51

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1226.00 DOWNSTREAM(FEET) = 1048.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 446.00 CHANNEL SLOPE = 0.3991

CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.813

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.92

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.85

AVERAGE FLOW DEPTH(FEET) = 0.03 TRAVEL TIME(MIN.) = 2.61

Tc(MIN.) = 8.71

SUBAREA AREA(ACRES) = 3.78 SUBAREA RUNOFF(CFS) = 9.01

AREA-AVERAGE RUNOFF COEFFICIENT = 0.350

TOTAL AREA(ACRES) = 3.9 PEAK FLOW RATE(CFS) = 9.25

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.04 FLOW VELOCITY(FEET/SEC.) = 4.13

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 541.00 FEET.

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 51

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1048.00 DOWNSTREAM(FEET) = 967.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 861.00 CHANNEL SLOPE = 0.0941
CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.287
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 21.20
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.42
AVERAGE FLOW DEPTH(FEET) = 0.11 TRAVEL TIME(MIN.) = 4.20
Tc(MIN.) = 12.91
SUBAREA AREA(ACRES) = 12.85 SUBAREA RUNOFF(CFS) = 23.78
AREA-AVERAGE RUNOFF COEFFICIENT = 0.350
TOTAL AREA(ACRES) = 16.7 PEAK FLOW RATE(CFS) = 30.96

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.14 FLOW VELOCITY(FEET/SEC.) = 3.82
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 1402.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 51

>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 967.00 DOWNSTREAM(FEET) = 838.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 580.00 CHANNEL SLOPE = 0.2224
CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.886
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4100
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 43.96
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.76
AVERAGE FLOW DEPTH(FEET) = 0.13 TRAVEL TIME(MIN.) = 1.68
Tc(MIN.) = 14.59
SUBAREA AREA(ACRES) = 13.00 SUBAREA RUNOFF(CFS) = 26.04
AREA-AVERAGE RUNOFF COEFFICIENT = 0.376
TOTAL AREA(ACRES) = 29.7 PEAK FLOW RATE(CFS) = 54.66

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.16 FLOW VELOCITY(FEET/SEC.) = 6.09
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 1982.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 51

>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 838.00 DOWNSTREAM(FEET) = 778.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 527.00 CHANNEL SLOPE = 0.1139
CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.550
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3700
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 62.34
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.16
AVERAGE FLOW DEPTH(FEET) = 0.20 TRAVEL TIME(MIN.) = 1.70
Tc(MIN.) = 16.29
SUBAREA AREA(ACRES) = 9.12 SUBAREA RUNOFF(CFS) = 15.36
AREA-AVERAGE RUNOFF COEFFICIENT = 0.375
TOTAL AREA(ACRES) = 38.8 PEAK FLOW RATE(CFS) = 66.25

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.21 FLOW VELOCITY(FEET/SEC.) = 5.25
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 2509.00 FEET.

*****
FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 778.00 DOWNSTREAM(FEET) = 754.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 571.00 CHANNEL SLOPE = 0.0420
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 3.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 5.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.292
*USER SPECIFIED(SUBAREA):
STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .3600
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 68.24
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.16
AVERAGE FLOW DEPTH(FEET) = 0.51 TRAVEL TIME(MIN.) = 1.54
Tc(MIN.) = 17.84
SUBAREA AREA(ACRES) = 2.57 SUBAREA RUNOFF(CFS) = 3.97
AREA-AVERAGE RUNOFF COEFFICIENT = 0.374
TOTAL AREA(ACRES) = 41.4 PEAK FLOW RATE(CFS) = 66.47

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.51 FLOW VELOCITY(FEET/SEC.) = 6.10
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 3080.00 FEET.

*****
FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 17.84
RAINFALL INTENSITY(INCH/HR) = 4.29
TOTAL STREAM AREA(ACRES) = 41.42
PEAK FLOW RATE(CFS) AT CONFLUENCE = 66.47
```

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

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

```
=====
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 105.00
UPSTREAM ELEVATION(FEET) = 1022.00
DOWNSTREAM ELEVATION(FEET) = 990.00
ELEVATION DIFFERENCE(FEET) = 32.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.267
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
         THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
         (Reference: Table 3-1B of Hydrology Manual)
         THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.427
SUBAREA RUNOFF(CFS) = 0.29
TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.29
```

FLOW PROCESS FROM NODE 111.00 TO NODE 106.00 IS CODE = 51

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

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

```
=====
ELEVATION DATA: UPSTREAM(FEET) = 990.00 DOWNSTREAM(FEET) = 754.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1020.00 CHANNEL SLOPE = 0.2314
CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.243
*USER SPECIFIED(SUBAREA):
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.30
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.50
AVERAGE FLOW DEPTH(FEET) = 0.03 TRAVEL TIME(MIN.) = 6.81
Tc(MIN.) = 13.08
SUBAREA AREA(ACRES) = 4.17 SUBAREA RUNOFF(CFS) = 7.65
AREA-AVERAGE RUNOFF COEFFICIENT = 0.350
```

TOTAL AREA(ACRES) = 4.3 PEAK FLOW RATE(CFS) = 7.84

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.05 FLOW VELOCITY(FEET/SEC.) = 3.07

LONGEST FLOWPATH FROM NODE 110.00 TO NODE 106.00 = 1125.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 13.08

RAINFALL INTENSITY(INCH/HR) = 5.24

TOTAL STREAM AREA(ACRES) = 4.27

PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.84

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	66.47	17.84	4.292	41.42
2	7.84	13.08	5.243	4.27

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	56.58	13.08	5.243
2	72.88	17.84	4.292

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 72.88 Tc(MIN.) = 17.84

TOTAL AREA(ACRES) = 45.7

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 3080.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 51

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 754.00 DOWNSTREAM(FEET) = 736.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 268.00 CHANNEL SLOPE = 0.0672

CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 3.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 5.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.232

*USER SPECIFIED(SUBAREA):

URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .3900

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 73.85

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 11.38

AVERAGE FLOW DEPTH(FEET) = 0.31 TRAVEL TIME(MIN.) = 0.39

Tc(MIN.) = 18.23

SUBAREA AREA(ACRES) = 1.17 SUBAREA RUNOFF(CFS) = 1.93

AREA-AVERAGE RUNOFF COEFFICIENT = 0.372

TOTAL AREA(ACRES) = 46.9 PEAK FLOW RATE(CFS) = 73.80

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.31 FLOW VELOCITY(FEET/SEC.) = 11.38

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 3348.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 51

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

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

ELEVATION DATA: UPSTREAM(FEET) = 736.00 DOWNSTREAM(FEET) = 730.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 359.00 CHANNEL SLOPE = 0.0167

CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 3.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 5.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.055

*USER SPECIFIED(SUBAREA):

URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4400

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 75.48

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.77

AVERAGE FLOW DEPTH(FEET) = 0.71 TRAVEL TIME(MIN.) = 1.25

Tc(MIN.) = 19.48

SUBAREA AREA(ACRES) = 1.89 SUBAREA RUNOFF(CFS) = 3.37

AREA-AVERAGE RUNOFF COEFFICIENT = 0.375

TOTAL AREA(ACRES) = 48.7 PEAK FLOW RATE(CFS) = 74.07

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.70 FLOW VELOCITY(FEET/SEC.) = 4.75

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 3707.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 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.) = 19.48

RAINFALL INTENSITY(INCH/HR) = 4.05

TOTAL STREAM AREA(ACRES) = 48.75
PEAK FLOW RATE(CFS) AT CONFLUENCE = 74.07

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00

UPSTREAM ELEVATION(FEET) = 858.00

DOWNSTREAM ELEVATION(FEET) = 832.00

ELEVATION DIFFERENCE(FEET) = 26.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.267

WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.427

SUBAREA RUNOFF(CFS) = 0.29

TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.29

FLOW PROCESS FROM NODE 113.00 TO NODE 108.00 IS CODE = 51

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 832.00 DOWNSTREAM(FEET) = 730.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1311.00 CHANNEL SLOPE = 0.0778

CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.280

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3800

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.57

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.88

AVERAGE FLOW DEPTH(FEET) = 0.06 TRAVEL TIME(MIN.) = 11.65

Tc(MIN.) = 17.91

SUBAREA AREA(ACRES) = 5.97 SUBAREA RUNOFF(CFS) = 9.71

AREA-AVERAGE RUNOFF COEFFICIENT = 0.380

TOTAL AREA(ACRES) = 6.1 PEAK FLOW RATE(CFS) = 9.86

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.08 FLOW VELOCITY(FEET/SEC.) = 2.31

LONGEST FLOWPATH FROM NODE 112.00 TO NODE 108.00 = 1411.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 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.) = 17.91
RAINFALL INTENSITY(INCH/HR) = 4.28
TOTAL STREAM AREA(ACRES) = 6.07
PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.86

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	74.07	19.48	4.055	48.75
2	9.86	17.91	4.280	6.07

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	80.03	17.91	4.280
2	83.41	19.48	4.055

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 83.41 Tc(MIN.) = 19.48
TOTAL AREA(ACRES) = 54.8
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 3707.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 41

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 730.00 DOWNSTREAM(FEET) = 724.00
FLOW LENGTH(FEET) = 139.00 MANNING'S N = 0.024
DEPTH OF FLOW IN 28.0 INCH PIPE IS 18.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.38
GIVEN PIPE DIAMETER(INCH) = 28.00 NUMBER OF PIPES = 3
PIPE-FLOW(CFS) = 83.41
PIPE TRAVEL TIME(MIN.) = 0.25 Tc(MIN.) = 19.73
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 3846.00 FEET.

Existing conditions has four (4)
- 24" pipes. Due to limitations
in AES. Only three (3) - 28"
pipes were modeled.

FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 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.) = 19.73
RAINFALL INTENSITY(INCH/HR) = 4.02
TOTAL STREAM AREA(ACRES) = 54.82
PEAK FLOW RATE(CFS) AT CONFLUENCE = 83.41

FLOW PROCESS FROM NODE 114.00 TO NODE 115.00 IS CODE = 21

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

=====

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00

UPSTREAM ELEVATION(FEET) = 858.00

DOWNSTREAM ELEVATION(FEET) = 838.00

ELEVATION DIFFERENCE(FEET) = 20.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.267

WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN T_c CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.427

SUBAREA RUNOFF(CFS) = 0.29

TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.29

FLOW PROCESS FROM NODE 115.00 TO NODE 116.00 IS CODE = 51

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 838.00 DOWNSTREAM(FEET) = 738.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 430.00 CHANNEL SLOPE = 0.2326

CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.562

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.17

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.26

AVERAGE FLOW DEPTH(FEET) = 0.02 TRAVEL TIME(MIN.) = 5.67

T_c(MIN.) = 11.94

SUBAREA AREA(ACRES) = 0.83 SUBAREA RUNOFF(CFS) = 1.62

AREA-AVERAGE RUNOFF COEFFICIENT = 0.350

TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 1.81

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.02 FLOW VELOCITY(FEET/SEC.) = 1.77

LONGEST FLOWPATH FROM NODE 114.00 TO NODE 116.00 = 530.00 FEET.

FLOW PROCESS FROM NODE 116.00 TO NODE 109.00 IS CODE = 51

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

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

ELEVATION DATA: UPSTREAM(FEET) = 738.00 DOWNSTREAM(FEET) = 724.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 770.00 CHANNEL SLOPE = 0.0182

CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 50.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 1.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.109

*USER SPECIFIED(SUBAREA):

URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4800

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.63

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.80

AVERAGE FLOW DEPTH(FEET) = 0.27 TRAVEL TIME(MIN.) = 7.15

Tc(MIN.) = 19.08

SUBAREA AREA(ACRES) = 4.90 SUBAREA RUNOFF(CFS) = 9.67

AREA-AVERAGE RUNOFF COEFFICIENT = 0.459

TOTAL AREA(ACRES) = 5.8 PEAK FLOW RATE(CFS) = 11.00

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.33 FLOW VELOCITY(FEET/SEC.) = 2.01

LONGEST FLOWPATH FROM NODE 114.00 TO NODE 109.00 = 1300.00 FEET.

FLOW PROCESS FROM NODE 109.00 TO NODE 109.00 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.) = 19.08

RAINFALL INTENSITY(INCH/HR) = 4.11

TOTAL STREAM AREA(ACRES) = 5.83

PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.00

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	83.41	19.73	4.022	54.82
2	11.00	19.08	4.109	5.83

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	92.64	19.08	4.109
2	94.18	19.73	4.022

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 94.18 Tc(MIN.) = 19.73

TOTAL AREA(ACRES) = 60.6

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 109.00 = 3846.00 FEET.

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

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

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*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00

UPSTREAM ELEVATION(FEET) = 1122.00

DOWNSTREAM ELEVATION(FEET) = 1096.00

ELEVATION DIFFERENCE(FEET) = 26.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.267

WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.427

SUBAREA RUNOFF(CFS) = 0.29

TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.29

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 51

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1096.00 DOWNSTREAM(FEET) = 736.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1658.00 CHANNEL SLOPE = 0.2171

CHANNEL BASE(FEET) = 50.00 "Z" FACTOR = 50.000

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.950

*USER SPECIFIED(SUBAREA):

NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 10.59

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.44

AVERAGE FLOW DEPTH(FEET) = 0.06 TRAVEL TIME(MIN.) = 8.03

Tc(MIN.) = 14.30

SUBAREA AREA(ACRES) = 11.30 SUBAREA RUNOFF(CFS) = 19.58

AREA-AVERAGE RUNOFF COEFFICIENT = 0.350

TOTAL AREA(ACRES) = 11.4 PEAK FLOW RATE(CFS) = 19.75

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.09 FLOW VELOCITY(FEET/SEC.) = 4.19

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1758.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 41

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

>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 736.00 DOWNSTREAM(FEET) = 734.00

FLOW LENGTH(FEET) = 192.00 MANNING'S N = 0.024

ASSUME FULL-FLOWING PIPELINE

PIPE-FLOW VELOCITY(FEET/SEC.) = 6.29

PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)

GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 19.75

PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 14.81

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 1950.00 FEET.

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

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.840

*USER SPECIFIED(SUBAREA):

GENERAL COMMERCIAL RUNOFF COEFFICIENT = .6100

S.C.S. CURVE NUMBER (AMC II) = 0

AREA-AVERAGE RUNOFF COEFFICIENT = 0.3684

SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 2.57

TOTAL AREA(ACRES) = 12.3 TOTAL RUNOFF(CFS) = 21.88

TC(MIN.) = 14.81

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

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

*USER SPECIFIED(SUBAREA):

URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .5000

S.C.S. CURVE NUMBER (AMC II) = 0

INITIAL SUBAREA FLOW-LENGTH(FEET) = 94.00

UPSTREAM ELEVATION(FEET) = 727.00

DOWNSTREAM ELEVATION(FEET) = 726.30

ELEVATION DIFFERENCE(FEET) = 0.70

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 9.022

WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

THE MAXIMUM OVERLAND FLOW LENGTH = 57.34

(Reference: Table 3-1B of Hydrology Manual)

THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN T_c CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.662
SUBAREA RUNOFF(CFS) = 0.33
TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.33

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 51

>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 726.30 DOWNSTREAM(FEET) = 726.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 412.00 CHANNEL SLOPE = 0.0007
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.391

*USER SPECIFIED(SUBAREA):

URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4700

S.C.S. CURVE NUMBER (AMC II) = 0

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.36

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 0.41

AVERAGE FLOW DEPTH(FEET) = 0.34 TRAVEL TIME(MIN.) = 16.68

T_c(MIN.) = 25.70

SUBAREA AREA(ACRES) = 2.39 SUBAREA RUNOFF(CFS) = 3.81

AREA-AVERAGE RUNOFF COEFFICIENT = 0.471

TOTAL AREA(ACRES) = 2.5 PEAK FLOW RATE(CFS) = 3.98

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.41 FLOW VELOCITY(FEET/SEC.) = 0.46

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 506.00 FEET.

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END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 2.5 TC(MIN.) = 25.70

PEAK FLOW RATE(CFS) = 3.98

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END OF RATIONAL METHOD ANALYSIS