

Appendices

Appendix G1 Hydrology Report

Appendices

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HYDROLOGY REPORT

Newport Crossings

Newport Beach, California

Prepared For

*Starboard Realty Partners, LLC
1301 Dove Street, Suite 1080
Irvine, CA 92612
949.851.2020*

Prepared By
Fusco Engineering, Inc.
6390 Greenwich Drive Suite 170
San Diego, California 92122
858.554.1500
www.fusco.com

Project Manager:
Bryan Smith, P.E.

Date Prepared: August 2017
Revised August 2018

Job Number: 1618.001

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DRAINAGE STUDY

NEWPORT CROSSINGS

Newport Beach, California

Prepared By Jesus Garcia Under the Responsible Charge of:



Bryan D. Smith, P.E.

RCE 75822

EXP: 06-30-20

Fuscoe Engineering, San Diego, Inc.
6390 Greenwich Dr., Ste 170
San Diego, CA 92122
For

Starboard Realty Partners, LLC
1301 Dove Street, Suite 1080
Newport Beach, CA 92660

August 2017
Revised August 2018



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Appendix 3	Existing and Proposed Condition Hydrology Maps
Appendix 4	Record Street Improvement Plans

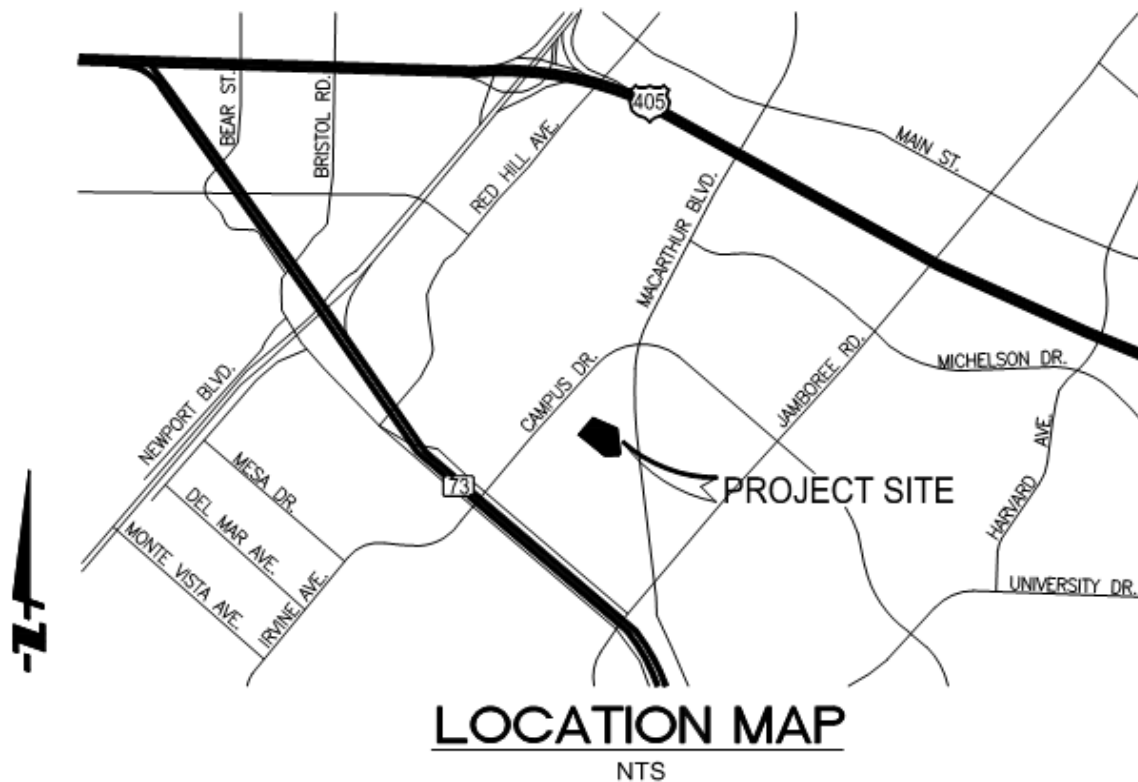
1.0 INTRODUCTION

1.1 GEOGRAPHIC SETTING

The Newport Crossings project site encompasses a total area of approximately 5.69 acres in the city of Newport Beach. The project site is bounded by Dove St to the south, Scott Dr. to the west, Corinthian Way to the north, and Martingale Way to the west.

Under existing conditions, the project site is primarily built out with several low rise commercial buildings and small businesses as well as surface parking. Landscaping areas with trees surround the site. Adjacent land uses include other commercial businesses such as Staples, a Radisson Hotel, Jamba Juice, and a car wash.

A Location Map is shown below.



1.2 PROJECT DESCRIPTION

The proposed project includes the development of a 350 unit residential project consisting of four (4) 5 story Type III-A residential buildings surrounding a 5-story (6 level) Type I-A parking structure with amenity deck and 7,500 sf of retail space. Recreation centers, such as pools, fitness spa facility, and other amenities, along with common-area landscaping are included in the proposed development.

1.3 PURPOSE OF THIS REPORT

The purpose of this report is to provide hydrologic calculations and maps for existing and proposed conditions for the proposed project entitlements.

1.4 REFERENCES

- Orange County Hydrology Manual
- A.E.S. hydrologic software

2.0 EXISTING DRAINAGE

2.1 EXISTING TOPOGRAPHY

The topography of the site varies, with slopes ranging from about 1-percent to approximately 4-percent. The ground surface elevation at the site varies from about 175 feet to 180 feet above mean sea level.

2.2 EXISTING DRAINAGE PATTERN

The roof drainage from the existing building is directed to the existing on-site area surrounding the building. The roof and surface drainage is conveyed along the property, and exits the property at the southeast driveway at Westerly Place before entering the underground public storm drain system at the existing curb inlet.

The site's existing high point is onsite at the northeast corner at the intersection of Corinthian Way and Martingale Way. Drainage is then conveyed by two routes via concrete valley gutters along the center of the parking drive aisles. One route travels the perimeter along the west and the second route travels southerly along the perimeter along the east. Drainage then converges and leaves the site at the southeast driveway on Dove Street at the Westerly Place intersection.

2.3 EXISTING STORM DRAIN FACILITIES

There are no existing underground storm drain facilities within the site; existing on-site drainage is conveyed as surface-flow, as discussed in the previous section.

From the driveway on Dove Street, the drainage is conveyed to the public right of way within the curb and gutter and enters the underground drainage system through a curb inlet at Westerly Place. The curb inlet conveys drainage through an 18" RCP lateral and into the 54" RCP pipe main sloping south along Dove Street. Existing street improvements plans are available on Appendix 4. Storm water runoff

generally flows southeast connecting into the San Diego Creek Channel, before ultimately discharging into Upper Newport Bay.

3.0 PROPOSED STORM DRAIN CONNECTION

The proposed project will consist of two separate 18" RCP lateral connections: One lateral serves the condominiums portion of the project and ties-into the 48" RCP main on Dove Street north of Westerly Place. The second lateral serves the proposed park and will connect to the existing lateral serving the curb inlet on Dove Street. Both connections are the collect storm water runoff and convey it underground along the perimeter of the site and drain to the discharge location at the southwest intersection corner of the property, and outlet into an existing curb and gutter in the existing driveway. Two proposed private drain systems; one for the condominiums and one for the park, will convey the stormwater to the discharge location.

4.0 HYDROLOGY

4.1 STORM FREQUENCY

The 25-year storm event was used for the proposed design. The 2-year storm event was used to supplement BMP design in the WQMP for this projects.

4.2 METHODOLOGY

This study was prepared in conformance with the Orange County Hydrology Manual. A.E.S. Computer Software was utilized to compile the hydrologic data and to determine the peak discharges. The Rational Method Hydrology Calculations are included in Appendix 1. The Hydrograph Calculations are included in Appendix 2. The y-bar and hydrograph calculations are included in Appendix 3. The Existing and Proposed Condition Hydrology Maps are included in Appendix 4.

5.0 RESULTS AND CONCLUSIONS

The results of the proposed condition design hydrology analyses are shown in the following tables.

ONSITE PEAK DISCHARGE SUMMARY

	Q ₂₅	T _c	Area
Existing (node 104)	15.09 cfs	10.68 minutes	5.69 ac
Proposed (node 300)	15.35 cfs	11.81 minutes	5.69 ac

TOTAL PEAK DISCHARGE SUMMARY

	Q ₂₅	T _c	Area
Existing (node 100)	23.73 cfs	12.32 minutes	9.41 ac
Proposed (node 100)	23.53 cfs	11.88 minutes	9.41 ac

The onsite comparison of the Q25 storm runoff for the developed condition is 0.26 cfs more from existing condition. However, for the total peak discharge (confluence with street runoff) entering the public storm drain system the peak flowrate for the developed conditions is 0.2 cfs less than existing.

In existing conditions for the Q25 storm event the onsite runoff combines with runoff from public streets before entering a curb inlet in the ROW. A public SD lateral (node 100) ties the curb inlet to the 54" RCP main at a manhole located in the intersection of Dove Street and Westerly Place. The curb inlet lateral serves as the point of analysis for the total peak discharge of the developed project.

6.0 APPENDICES

Appendix 1	A.E.S. Rational Method Hydrology Calculations
Appendix 2	A.E.S. Unit Hydrograph Calculations and Low Loss Fraction Estimations
Appendix 3	Existing and Proposed Condition Hydrology Maps
Appendix 4	Record Street Improvement Plans

Appendix 1

A.E.S. Rational Method Hydrology Calculations



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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
 (c) Copyright 1983-2014 Advanced Engineering Software (aes)
 Ver. 21.0 Release Date: 06/01/2014 License ID 1355

Analysis prepared by:

Fuscoe Engineering
 6390 Greenwich Drive
 Suite 170
 San Diego, CA 92122

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

* NEWPORT CROSSINGS *
 * EXISTING CONDITION *
 * 25-YEAR STORM EVENT *

FILE NAME: 16181X25.DAT

TIME/DATE OF STUDY: 12:14 08/29/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 25.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90

DATA BANK RAINFALL USED

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	24.0	18.0	0.180/0.180/0.020	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

16181X25.RES

FLOW PROCESS FROM NODE 107.00 TO NODE 106.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 55.00
 ELEVATION DATA: UPSTREAM(FEET) = 52.90 DOWNSTREAM(FEET) = 52.60

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.000

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824

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	D	0.10	0.20	0.100	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.43

TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.43

FLOW PROCESS FROM NODE 106.00 TO NODE 105.00 IS CODE = 54

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

ELEVATION DATA: UPSTREAM(FEET) = 52.60 DOWNSTREAM(FEET) = 48.30

CHANNEL LENGTH THRU SUBAREA(FEET) = 980.00 CHANNEL SLOPE = 0.0044

CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 40.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 0.20

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.917

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	2.52	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.10

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.28

AVERAGE FLOW DEPTH(FEET) = 0.20 TRAVEL TIME(MIN.) = 7.16

16181X25.RES

Tc(MIN.) = 12.16
 SUBAREA AREA(ACRES) = 2.52 SUBAREA RUNOFF(CFS) = 6.57
 EFFECTIVE AREA(ACRES) = 2.62 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 2.6 PEAK FLOW RATE(CFS) = 6.83

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

*GIVEN HEIGHT(FEET) = 0.20 ESTIMATED CHANNEL BASE(FEET) = 11.27

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.20 FLOW VELOCITY(FEET/SEC.) = 1.77
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 105.00 = 1035.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 12.16
 RAINFALL INTENSITY(INCH/HR) = 2.92
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.62
 TOTAL STREAM AREA(ACRES) = 2.62
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.83

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 55.00
 ELEVATION DATA: UPSTREAM(FEET) = 52.90 DOWNSTREAM(FEET) = 52.60

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS	Tc
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LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN	(MIN.)
COMMERCIAL	D	0.10	0.20	0.100	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA RUNOFF(CFS) = 0.43
 TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.43

FLOW PROCESS FROM NODE 108.00 TO NODE 105.00 IS CODE = 54

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

ELEVATION DATA: UPSTREAM(FEET) = 52.60 DOWNSTREAM(FEET) = 48.30
 CHANNEL LENGTH THRU SUBAREA(FEET) = 610.00 CHANNEL SLOPE = 0.0070
 CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 40.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 0.20

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.150
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	D	1.74	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.06
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.81
 AVERAGE FLOW DEPTH(FEET) = 0.19 TRAVEL TIME(MIN.) = 5.62
 T_c (MIN.) = 10.62
 SUBAREA AREA(ACRES) = 1.74 SUBAREA RUNOFF(CFS) = 4.90
 EFFECTIVE AREA(ACRES) = 1.84 AREA-AVERAGED F_m (INCH/HR) = 0.02
 AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED A_p = 0.10
 TOTAL AREA(ACRES) = 1.8 PEAK FLOW RATE(CFS) = 5.18

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

*GIVEN HEIGHT(FEET) = 0.20 ESTIMATED CHANNEL BASE(FEET) = 4.63

16181X25.RES

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.20 FLOW VELOCITY(FEET/SEC.) = 2.05

LONGEST FLOWPATH FROM NODE 107.00 TO NODE 105.00 = 665.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 10.62

RAINFALL INTENSITY(INCH/HR) = 3.15

AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20

AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA(ACRES) = 1.84

TOTAL STREAM AREA(ACRES) = 1.84

PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.18

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.83	12.16	2.917	0.20(0.02)	0.10	2.6	107.00
2	5.18	10.62	3.150	0.20(0.02)	0.10	1.8	107.00

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	11.63	10.62	3.150	0.20(0.02)	0.10	4.1	107.00
2	11.63	12.16	2.917	0.20(0.02)	0.10	4.5	107.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 11.63 Tc(MIN.) = 12.16

EFFECTIVE AREA(ACRES) = 4.46 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 4.5

LONGEST FLOWPATH FROM NODE 107.00 TO NODE 105.00 = 1035.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

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

16181X25.RES

MAINLINE Tc(MIN.) = 12.16

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.917

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	1.23	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.23 SUBAREA RUNOFF(CFS) = 3.21
 EFFECTIVE AREA(ACRES) = 5.69 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 5.7 PEAK FLOW RATE(CFS) = 14.83

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	15.09	10.62	3.150	0.20(0.02)	0.10	5.4	107.00
2	14.83	12.16	2.917	0.20(0.02)	0.10	5.7	107.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 15.09 Tc(MIN.) = 10.62
 AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 5.36

FLOW PROCESS FROM NODE 105.00 TO NODE 104.00 IS CODE = 54

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

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 48.30 DOWNSTREAM(FEET) = 46.60
 CHANNEL LENGTH THRU SUBAREA(FEET) = 30.00 CHANNEL SLOPE = 0.0567
 CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 40.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 0.20

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

*GIVEN HEIGHT(FEET) = 0.20 ESTIMATED CHANNEL BASE(FEET) = 4.89
 CHANNEL FLOW THRU SUBAREA(CFS) = 15.09
 FLOW VELOCITY(FEET/SEC.) = 5.86 FLOW DEPTH(FEET) = 0.20
 TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 10.68
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 104.00 = 1065.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 10.68
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.140
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.66	0.20	0.100	75

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.66 SUBAREA RUNOFF(CFS) = 1.85
 EFFECTIVE AREA(ACRES) = 6.02 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 16.90

 FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 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.) = 10.68
 RAINFALL INTENSITY(INCH/HR) = 3.14
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 6.02
 TOTAL STREAM AREA(ACRES) = 6.35
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.90

 FLOW PROCESS FROM NODE 103.00 TO NODE 102.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 40.00
 ELEVATION DATA: UPSTREAM(FEET) = 53.60 DOWNSTREAM(FEET) = 52.80

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.10	0.20	0.100	75	5.00

16181X25.RES

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.20$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$

SUBAREA RUNOFF(CFS) = 0.43

TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.43

FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

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

MAINLINE $T_c(\text{MIN.}) = 5.00$

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	D	0.84	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.20$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$

SUBAREA AREA(ACRES) = 0.84 SUBAREA RUNOFF(CFS) = 3.63

EFFECTIVE AREA(ACRES) = 0.94 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.02$

AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.20$ AREA-AVERAGED $A_p = 0.10$

TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 4.06

FLOW PROCESS FROM NODE 102.00 TO NODE 101.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 1 USED)<<<<

UPSTREAM ELEVATION(FEET) = 52.80 DOWNSTREAM ELEVATION(FEET) = 46.40

STREET LENGTH(FEET) = 1570.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 24.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 18.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.180

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.180

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.64

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.72

HALFSTREET FLOOD WIDTH(FEET) = 7.84

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.11

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.25

16181X25.RES

STREET FLOW TRAVEL TIME(MIN.) = 8.42 Tc(MIN.) = 13.42

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.758

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	2.11	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 2.11 SUBAREA RUNOFF(CFS) = 5.20
 EFFECTIVE AREA(ACRES) = 3.05 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 7.52

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 9.79

FLOW VELOCITY(FEET/SEC.) = 3.07 DEPTH*VELOCITY(FT*FT/SEC.) = 2.33

LONGEST FLOWPATH FROM NODE 103.00 TO NODE 101.00 = 1610.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 101.00 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.) = 13.42

RAINFALL INTENSITY(INCH/HR) = 2.76

AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20

AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA(ACRES) = 3.05

TOTAL STREAM AREA(ACRES) = 3.05

PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.52

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	16.90	10.68	3.140	0.20(0.02)	0.10	6.0	107.00
1	16.51	12.22	2.908	0.20(0.02)	0.10	6.3	107.00
2	7.52	13.42	2.758	0.20(0.02)	0.10	3.0	103.00

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	16.90	10.68	3.140	0.20(0.02)	0.10	6.0	107.00
1	16.51	12.22	2.908	0.20(0.02)	0.10	6.3	107.00
2	7.52	13.42	2.758	0.20(0.02)	0.10	3.0	103.00

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1	23.71	10.68	3.140	0.20(0.02)	0.10	8.4	107.00
2	23.73	12.22	2.908	0.20(0.02)	0.10	9.1	107.00
3	23.17	13.42	2.758	0.20(0.02)	0.10	9.4	103.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 23.73 Tc(MIN.) = 12.22
 EFFECTIVE AREA(ACRES) = 9.13 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 9.4
 LONGEST FLOWPATH FROM NODE 103.00 TO NODE 101.00 = 1610.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 100.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 39.70 DOWNSTREAM(FEET) = 39.20
 FLOW LENGTH(FEET) = 50.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.22
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 23.73
 PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 12.32
 LONGEST FLOWPATH FROM NODE 103.00 TO NODE 100.00 = 1660.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 9.4 TC(MIN.) = 12.32
 EFFECTIVE AREA(ACRES) = 9.13 AREA-AVERAGED Fm(INCH/HR)= 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS) = 23.73

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	23.71	10.78	3.123	0.20(0.02)	0.10	8.4	107.00
2	23.73	12.32	2.895	0.20(0.02)	0.10	9.1	107.00
3	23.17	13.52	2.747	0.20(0.02)	0.10	9.4	103.00

END OF RATIONAL METHOD ANALYSIS

↑



Job Name: Newport Crossings

Date: 8/28/2018

Job #: 1618-001

Run Name: 16181PR25

Description: Proposed 25 year design storm

Page: 1

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	Runoff Coeff. (C)	Area (ac.)	Comments
306	305	2	124.2	123.5	65.0	D	0.10	INITIAL SUBAREA
305	304	5	52.0	50.8	60.0			SURFACE FLOW
304	304	8				D	0.59	ADDITION OF SUBAREA C1
304	303	3	46.8	45.0	445.0			PIPE FLOW
303	303	8				D	0.49	ADDITION OF SUBAREA C2
303	302	3	45.0	44.1	225.0			PIPE FLOW
302	302	8				D	1.50	ADDITION OF SUBAREA C3
302	301	3	44.1	43.0	250.0			PIPE FLOW
301	301	1						CONFLUENCE 1 OF 2
306	305	2	124.2	122.9	65.0	D	0.10	INITIAL SUBAREA
305	309	5	52.0	51.1	75.0			SURFACE FLOW
309	309	8				D	0.22	ADDITION OF SUBAREA C4
309	308	3	47.1	45.8	255.0			PIPE FLOW
308	308	8				D	0.51	ADDITION OF SUBAREA C5
308	307	3	45.8	44.1	335.0			PIPE FLOW
307	307	8				D	1.57	ADDITION OF SUBAREA C6
307	301	3	44.1	43.0	215.0			PIPE FLOW
301	301	1						CONFLUENCE 2 OF 2
301	300	3	39.8	39.7	35.0			PIPE FLOW

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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Analysis prepared by:

Fuscoe Engineering
 6390 Greenwich Drive
 Suite 170
 San Diego, CA 92122

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

* NEWPORT CROSSINGS *
 * PROPOSED CONDITION *
 * 25-YEAR STORM EVENT *

FILE NAME: 16181P25.DAT

TIME/DATE OF STUDY: 16:48 08/28/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 25.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90

DATA BANK RAINFALL USED

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	24.0	18.0	0.180/0.180/0.020	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

16181P25.RES

FLOW PROCESS FROM NODE 306.00 TO NODE 305.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
 ELEVATION DATA: UPSTREAM(FEET) = 124.20 DOWNSTREAM(FEET) = 123.50

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.000

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824

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.)
CONDOMINIUMS	D	0.10	0.20	0.350	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350

SUBAREA RUNOFF(CFS) = 0.43

TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.43

FLOW PROCESS FROM NODE 305.00 TO NODE 304.00 IS CODE = 54

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

ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 50.80
 CHANNEL LENGTH THRU SUBAREA(FEET) = 60.00 CHANNEL SLOPE = 0.0200
 CHANNEL BASE(FEET) = 100.00 "Z" FACTOR = 99.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 0.43
 FLOW VELOCITY(FEET/SEC.) = 0.40 FLOW DEPTH(FEET) = 0.01
 TRAVEL TIME(MIN.) = 2.48 T_c (MIN.) = 7.48
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 304.00 = 125.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

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

MAINLINE T_c (MIN.) = 7.48

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.841

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.59	0.20	0.350	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

16181P25.RES

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.350$
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 2.00
 EFFECTIVE AREA(ACRES) = 0.69 AREA-AVERAGED F_m (INCH/HR) = 0.07
 AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED $A_p = 0.35$
 TOTAL AREA(ACRES) = 0.7 PEAK FLOW RATE(CFS) = 2.34

FLOW PROCESS FROM NODE 304.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(Feet) = 46.80 DOWNSTREAM(Feet) = 45.00
 FLOW LENGTH(Feet) = 445.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.4 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 3.32
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.34
 PIPE TRAVEL TIME(MIN.) = 2.24 T_c (MIN.) = 9.71
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 303.00 = 570.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

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

MAINLINE T_c (MIN.) = 9.71
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.313
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.49	0.20	0.350	75

 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.350$
 SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 1.43
 EFFECTIVE AREA(ACRES) = 1.18 AREA-AVERAGED F_m (INCH/HR) = 0.07
 AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED $A_p = 0.35$
 TOTAL AREA(ACRES) = 1.2 PEAK FLOW RATE(CFS) = 3.44

FLOW PROCESS FROM NODE 303.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(Feet) = 45.00 DOWNSTREAM(Feet) = 44.10
 FLOW LENGTH(Feet) = 225.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 11.0 INCHES

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                                16181P25.RES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.57
ESTIMATED PIPE DIAMETER(INCH) = 15.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.44
PIPE TRAVEL TIME(MIN.) = 1.05    Tc(MIN.) = 10.76
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 302.00 = 795.00 FEET.

*****
FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 10.76
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.126
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS
LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
CONDOMINIUMS          D      1.50    0.20    0.350    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA(ACRES) = 1.50    SUBAREA RUNOFF(CFS) = 4.12
EFFECTIVE AREA(ACRES) = 2.68    AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20    AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 2.7    PEAK FLOW RATE(CFS) = 7.37

*****
FLOW PROCESS FROM NODE 302.00 TO NODE 301.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 44.10    DOWNSTREAM(FEET) = 43.00
FLOW LENGTH(FEET) = 250.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.53
ESTIMATED PIPE DIAMETER(INCH) = 21.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.37
PIPE TRAVEL TIME(MIN.) = 0.92    Tc(MIN.) = 11.68
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 301.00 = 1045.00 FEET.

*****
FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 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.) = 11.68
RAINFALL INTENSITY(INCH/HR) = 2.98

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                                16181P25.RES
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.35
EFFECTIVE STREAM AREA(ACRES) = 2.68
TOTAL STREAM AREA(ACRES) = 2.68
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.37

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 305.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
ELEVATION DATA: UPSTREAM(FEET) = 124.20 DOWNSTREAM(FEET) = 122.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824
SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS      Tc
    LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
CONDOMINIUMS           D       0.10     0.20     0.350    75     5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA RUNOFF(CFS) = 0.43
TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.43

*****
FLOW PROCESS FROM NODE 305.00 TO NODE 309.00 IS CODE = 54
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 51.10
CHANNEL LENGTH THRU SUBAREA(FEET) = 75.00 CHANNEL SLOPE = 0.0120
CHANNEL BASE(FEET) = 100.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 0.43
FLOW VELOCITY(FEET/SEC.) = 0.40 FLOW DEPTH(FEET) = 0.01
TRAVEL TIME(MIN.) = 3.10 Tc(MIN.) = 8.10
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 309.00 = 140.00 FEET.

*****
FLOW PROCESS FROM NODE 309.00 TO NODE 309.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

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16181P25.RES

MAINLINE Tc(MIN.) = 8.10

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.672

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.22	0.20	0.350	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
 SUBAREA AREA(ACRES) = 0.22 SUBAREA RUNOFF(CFS) = 0.71
 EFFECTIVE AREA(ACRES) = 0.32 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 1.04

FLOW PROCESS FROM NODE 309.00 TO NODE 308.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 47.10 DOWNSTREAM(FEET) = 45.80
 FLOW LENGTH(FEET) = 255.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 6.9 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 2.87
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.04
 PIPE TRAVEL TIME(MIN.) = 1.48 Tc(MIN.) = 9.58
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 308.00 = 395.00 FEET.

FLOW PROCESS FROM NODE 308.00 TO NODE 308.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 9.58
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.339
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.51	0.20	0.350	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
 SUBAREA AREA(ACRES) = 0.51 SUBAREA RUNOFF(CFS) = 1.50
 EFFECTIVE AREA(ACRES) = 0.83 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 0.8 PEAK FLOW RATE(CFS) = 2.44

FLOW PROCESS FROM NODE 308.00 TO NODE 307.00 IS CODE = 31

```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 45.80 DOWNSTREAM(FEET) = 44.10
FLOW LENGTH(FEET) = 335.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.65
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.44
PIPE TRAVEL TIME(MIN.) = 1.53 Tc(MIN.) = 11.10
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 307.00 = 730.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

```

```

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

```

```

=====
MAINLINE Tc(MIN.) = 11.10
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.071
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
CONDOMINIUMS          D        1.57    0.20    0.350    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA(ACRES) = 1.57 SUBAREA RUNOFF(CFS) = 4.24
EFFECTIVE AREA(ACRES) = 2.40 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 2.4 PEAK FLOW RATE(CFS) = 6.48

```

```

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 301.00 IS CODE = 31

```

```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 44.10 DOWNSTREAM(FEET) = 43.00
FLOW LENGTH(FEET) = 215.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.57
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 6.48
PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 11.89
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 301.00 = 945.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 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.) = 11.89
 RAINFALL INTENSITY(INCH/HR) = 2.95
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 2.40
 TOTAL STREAM AREA(ACRES) = 2.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.48

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	7.37	11.68	2.984	0.20(0.07)	0.35	2.7	306.00
2	6.48	11.89	2.954	0.20(0.07)	0.35	2.4	306.00

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	13.80	11.68	2.984	0.20(0.07)	0.35	5.0	306.00
2	13.78	11.89	2.954	0.20(0.07)	0.35	5.1	306.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 13.80 Tc(MIN.) = 11.68
 EFFECTIVE AREA(ACRES) = 5.04 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 5.1
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 301.00 = 1045.00 FEET.

FLOW PROCESS FROM NODE 301.00 TO NODE 300.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 39.80 DOWNSTREAM(FEET) = 39.70
 FLOW LENGTH(FEET) = 35.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.45
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1

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PIPE-FLOW(CFS) = 13.80
 PIPE TRAVEL TIME(MIN.) = 0.13 Tc(MIN.) = 11.81
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 300.00 = 1080.00 FEET.

FLOW PROCESS FROM NODE 300.00 TO NODE 300.00 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.) = 11.81
 RAINFALL INTENSITY(INCH/HR) = 2.97
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 5.04
 TOTAL STREAM AREA(ACRES) = 5.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.80

FLOW PROCESS FROM NODE 203.00 TO NODE 202.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 145.00
 ELEVATION DATA: UPSTREAM(FEET) = 52.90 DOWNSTREAM(FEET) = 50.60

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.099
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.671
 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	D	0.10	0.20	0.850	75	8.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF(CFS) = 0.32
 TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.32

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 8.10
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.671

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SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	D	0.16	0.20	0.850	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.16 SUBAREA RUNOFF(CFS) = 0.50
 EFFECTIVE AREA(ACRES) = 0.26 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 0.82

FLOW PROCESS FROM NODE 202.00 TO NODE 201.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 44.00 DOWNSTREAM(FEET) = 41.80
 FLOW LENGTH(FEET) = 220.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 4.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.59
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 0.82
 PIPE TRAVEL TIME(MIN.) = 1.02 Tc(MIN.) = 9.12
 LONGEST FLOWPATH FROM NODE 203.00 TO NODE 201.00 = 365.00 FEET.

FLOW PROCESS FROM NODE 201.00 TO NODE 201.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 9.12
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.433
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	D	0.35	0.20	0.850	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.35 SUBAREA RUNOFF(CFS) = 1.03
 EFFECTIVE AREA(ACRES) = 0.61 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 1.79

FLOW PROCESS FROM NODE 201.00 TO NODE 300.00 IS CODE = 31

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

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

```
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.80 DOWNSTREAM(FEET) = 39.70
FLOW LENGTH(FEET) = 40.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 4.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.12
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.79
PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 9.20
LONGEST FLOWPATH FROM NODE 203.00 TO NODE 300.00 = 405.00 FEET.
```

```
FLOW PROCESS FROM NODE 300.00 TO NODE 300.00 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.) = 9.20
RAINFALL INTENSITY(INCH/HR) = 3.42
AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.85
EFFECTIVE STREAM AREA(ACRES) = 0.61
TOTAL STREAM AREA(ACRES) = 0.61
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.79
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	13.80	11.81	2.965	0.20(0.07)	0.35	5.0	306.00
1	13.78	12.02	2.936	0.20(0.07)	0.35	5.1	306.00
2	1.79	9.20	3.415	0.20(0.17)	0.85	0.6	203.00

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	14.22	9.20	3.415	0.20(0.08)	0.42	4.5	203.00
2	15.35	11.81	2.965	0.20(0.08)	0.40	5.6	306.00
3	15.30	12.02	2.936	0.20(0.08)	0.40	5.7	306.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```
PEAK FLOW RATE(CFS) = 15.35 Tc(MIN.) = 11.81
EFFECTIVE AREA(ACRES) = 5.65 AREA-AVERAGED Fm(INCH/HR) = 0.08
```

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AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.40
TOTAL AREA(ACRES) = 5.7
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 300.00 = 1080.00 FEET.

*****
FLOW PROCESS FROM NODE 101.00 TO NODE 101.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 11.81
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.965
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL D 0.66 0.20 0.100 75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.66 SUBAREA RUNOFF(CFS) = 1.75
EFFECTIVE AREA(ACRES) = 6.31 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.37
TOTAL AREA(ACRES) = 6.3 PEAK FLOW RATE(CFS) = 16.41

*****
FLOW PROCESS FROM NODE 101.00 TO NODE 101.00 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.) = 11.81
RAINFALL INTENSITY(INCH/HR) = 2.97
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.37
EFFECTIVE STREAM AREA(ACRES) = 6.31
TOTAL STREAM AREA(ACRES) = 6.35
PEAK FLOW RATE(CFS) AT CONFLUENCE = 16.41

*****
FLOW PROCESS FROM NODE 103.00 TO NODE 102.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 40.00
ELEVATION DATA: UPSTREAM(FEET) = 53.60 DOWNSTREAM(FEET) = 52.80

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

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SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.10	0.20	0.100	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.43

TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.43

FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 5.00

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.84	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 0.84 SUBAREA RUNOFF(CFS) = 3.63

EFFECTIVE AREA(ACRES) = 0.94 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 4.06

FLOW PROCESS FROM NODE 102.00 TO NODE 101.00 IS CODE = 62

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STREET TABLE SECTION # 1 USED)<<<<

UPSTREAM ELEVATION(FEET) = 52.80 DOWNSTREAM ELEVATION(FEET) = 46.40

STREET LENGTH(FEET) = 1570.00 CURB HEIGHT(INCHES) = 8.0

STREET HALFWIDTH(FEET) = 24.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 18.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.180

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.180

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

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**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.64

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.72

HALFSTREET FLOOD WIDTH(FEET) = 7.84

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.11

PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 2.25

STREET FLOW TRAVEL TIME(MIN.) = 8.42 Tc(MIN.) = 13.42

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.758

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	2.11	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 2.11 SUBAREA RUNOFF(CFS) = 5.20

EFFECTIVE AREA(ACRES) = 3.05 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 7.52

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.76 HALFSTREET FLOOD WIDTH(FEET) = 9.79

FLOW VELOCITY(FEET/SEC.) = 3.07 DEPTH*VELOCITY(FT*FT/SEC.) = 2.33

LONGEST FLOWPATH FROM NODE 103.00 TO NODE 101.00 = 1610.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 101.00 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.) = 13.42

RAINFALL INTENSITY(INCH/HR) = 2.76

AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20

AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA(ACRES) = 3.05

TOTAL STREAM AREA(ACRES) = 3.05

PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.52

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	15.62	9.20	3.415	0.20(0.08)	0.38	5.2	203.00
1	16.41	11.81	2.965	0.20(0.07)	0.37	6.3	306.00
1	16.36	12.02	2.936	0.20(0.07)	0.37	6.3	306.00
2	7.52	13.42	2.758	0.20(0.02)	0.10	3.0	103.00

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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	22.00	9.20	3.415	0.20(0.06)	0.30	7.3	203.00
2	23.53	11.81	2.965	0.20(0.06)	0.29	9.0	306.00
3	23.52	12.02	2.936	0.20(0.06)	0.29	9.1	306.00
4	22.86	13.42	2.758	0.20(0.06)	0.28	9.4	103.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 23.53 Tc(MIN.) = 11.81
EFFECTIVE AREA(ACRES) = 8.99 AREA-AVERAGED Fm(INCH/HR) = 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 9.4
LONGEST FLOWPATH FROM NODE 103.00 TO NODE 101.00 = 1610.00 FEET.

FLOW PROCESS FROM NODE 101.00 TO NODE 100.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 39.70 DOWNSTREAM(FEET) = 38.00
FLOW LENGTH(FEET) = 50.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.93
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 23.53
PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 11.88
LONGEST FLOWPATH FROM NODE 103.00 TO NODE 100.00 = 1660.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 9.4 TC(MIN.) = 11.88
EFFECTIVE AREA(ACRES) = 8.99 AREA-AVERAGED Fm(INCH/HR)= 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.291
PEAK FLOW RATE(CFS) = 23.53

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.00	9.27	3.402	0.20(0.06)	0.30	7.3	203.00
2	23.53	11.88	2.956	0.20(0.06)	0.29	9.0	306.00
3	23.52	12.08	2.927	0.20(0.06)	0.29	9.1	306.00
4	22.86	13.49	2.751	0.20(0.06)	0.28	9.4	103.00

=====

END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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 Ver. 21.0 Release Date: 06/01/2014 License ID 1355

Analysis prepared by:

Fuscoe Engineering
 6390 Greenwich Drive
 Suite 170
 San Diego, CA 92122

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

* NEWPORT CROSSINGS *
 * EXISTING CONDITION *
 * 2-YEAR STORM EVENT *

FILE NAME: 16181EX2.DAT

TIME/DATE OF STUDY: 11:54 08/29/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90

DATA BANK RAINFALL USED

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	24.0	18.0	0.180/0.180/0.020	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

16181EX2.RES

FLOW PROCESS FROM NODE 107.00 TO NODE 106.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 55.00
 ELEVATION DATA: UPSTREAM(FEET) = 52.90 DOWNSTREAM(FEET) = 52.60

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

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.000

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264

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	D	0.10	0.20	0.100	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.20

TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.20

FLOW PROCESS FROM NODE 106.00 TO NODE 105.00 IS CODE = 54

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

ELEVATION DATA: UPSTREAM(FEET) = 52.60 DOWNSTREAM(FEET) = 48.30

CHANNEL LENGTH THRU SUBAREA(FEET) = 980.00 CHANNEL SLOPE = 0.0044

CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 50.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 0.12

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.312

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	2.52	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.87

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.06

AVERAGE FLOW DEPTH(FEET) = 0.12 TRAVEL TIME(MIN.) = 7.93

16181EX2.RES

Tc(MIN.) = 12.93
 SUBAREA AREA(ACRES) = 2.52 SUBAREA RUNOFF(CFS) = 2.93
 EFFECTIVE AREA(ACRES) = 2.62 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 2.6 PEAK FLOW RATE(CFS) = 3.05

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

*GIVEN HEIGHT(FEET) = 0.12 ESTIMATED CHANNEL BASE(FEET) = 11.87

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.12 FLOW VELOCITY(FEET/SEC.) = 1.35
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 105.00 = 1035.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 12.93
 RAINFALL INTENSITY(INCH/HR) = 1.31
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.62
 TOTAL STREAM AREA(ACRES) = 2.62
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.05

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 55.00
 ELEVATION DATA: UPSTREAM(FEET) = 52.90 DOWNSTREAM(FEET) = 52.60

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS	Tc
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16181EX2.RES

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN	(MIN.)
COMMERCIAL	D	0.10	0.20	0.100	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA RUNOFF(CFS) = 0.20
 TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.20

FLOW PROCESS FROM NODE 108.00 TO NODE 105.00 IS CODE = 54

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

ELEVATION DATA: UPSTREAM(Feet) = 52.60 DOWNSTREAM(Feet) = 48.30
 CHANNEL LENGTH THRU SUBAREA(Feet) = 610.00 CHANNEL SLOPE = 0.0070
 CHANNEL BASE(Feet) = 1.00 "Z" FACTOR = 50.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(Feet) = 0.12

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.397
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	D	1.74	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.40
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/Sec.) = 1.54
 AVERAGE FLOW DEPTH(Feet) = 0.12 TRAVEL TIME(Min.) = 6.59
 T_c (Min.) = 11.59
 SUBAREA AREA(ACRES) = 1.74 SUBAREA RUNOFF(CFS) = 2.16
 EFFECTIVE AREA(ACRES) = 1.84 AREA-AVERAGED F_m (INCH/HR) = 0.02
 AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED A_p = 0.10
 TOTAL AREA(ACRES) = 1.8 PEAK FLOW RATE(CFS) = 2.28

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

*GIVEN HEIGHT(Feet) = 0.12 ESTIMATED CHANNEL BASE(Feet) = 5.43

16181EX2.RES

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.12 FLOW VELOCITY(FEET/SEC.) = 1.56

LONGEST FLOWPATH FROM NODE 107.00 TO NODE 105.00 = 665.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 11.59

RAINFALL INTENSITY(INCH/HR) = 1.40

AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20

AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA(ACRES) = 1.84

TOTAL STREAM AREA(ACRES) = 1.84

PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.28

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.05	12.93	1.312	0.20(0.02)	0.10	2.6	107.00
2	2.28	11.59	1.397	0.20(0.02)	0.10	1.8	107.00

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	5.19	11.59	1.397	0.20(0.02)	0.10	4.2	107.00
2	5.19	12.93	1.312	0.20(0.02)	0.10	4.5	107.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 5.19 Tc(MIN.) = 11.59

EFFECTIVE AREA(ACRES) = 4.19 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 4.5

LONGEST FLOWPATH FROM NODE 107.00 TO NODE 105.00 = 1035.00 FEET.

FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 81

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

16181EX2.RES

MAINLINE Tc(MIN.) = 11.59

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.397

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	1.23	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.23 SUBAREA RUNOFF(CFS) = 1.52
 EFFECTIVE AREA(ACRES) = 5.42 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 5.7 PEAK FLOW RATE(CFS) = 6.72

FLOW PROCESS FROM NODE 105.00 TO NODE 104.00 IS CODE = 54

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

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

ELEVATION DATA: UPSTREAM(FEET) = 48.30 DOWNSTREAM(FEET) = 46.60
 CHANNEL LENGTH THRU SUBAREA(FEET) = 30.00 CHANNEL SLOPE = 0.0567
 CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 50.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 0.12

==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
 CAPACITY(NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
 ALLOWABLE DEPTH).
 AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
 ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

*GIVEN HEIGHT(FEET) = 0.12 ESTIMATED CHANNEL BASE(FEET) = 5.79
 CHANNEL FLOW THRU SUBAREA(CFS) = 6.72
 FLOW VELOCITY(FEET/SEC.) = 4.46 FLOW DEPTH(FEET) = 0.12
 TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 11.66
 LONGEST FLOWPATH FROM NODE 107.00 TO NODE 104.00 = 1065.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 5.7 TC(MIN.) = 11.66
 EFFECTIVE AREA(ACRES) = 5.42 AREA-AVERAGED Fm(INCH/HR)= 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS) = 6.72

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (DECIMAL)	Ae (ACRES)	HEADWATER NODE
1	6.72	11.66	1.392	0.20(0.02)	0.10	5.4	107.00
2	6.62	13.00	1.308	0.20(0.02)	0.10	5.7	107.00

16181EX2.RES

=====

END OF RATIONAL METHOD ANALYSIS





Job Name: Newport Crossings

Date: 8/28/2018

Job #: 1618-001

Run Name: 16181PR2

Description: Proposed Onsite 2 year design storm

Page: 1

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	Runoff Coeff. (C)	Area (ac.)	Comments
306	305	2	124.2	123.5	65.0	D	0.10	INITIAL SUBAREA
305	304	5	52.0	50.8	60.0			SURFACE FLOW
304	304	8				D	0.59	ADDITION OF SUBAREA C1
304	303	3	46.8	45.0	445.0			PIPE FLOW
303	303	8				D	0.49	ADDITION OF SUBAREA C2
303	302	3	45.0	44.1	225.0			PIPE FLOW
302	302	8				D	1.50	ADDITION OF SUBAREA C3
302	301	3	44.1	43.0	250.0			PIPE FLOW
301	301	1						CONFLUENCE 1 OF 2
306	305	2	124.2	122.9	65.0	D	0.10	INITIAL SUBAREA
305	309	5	52.0	51.1	75.0			SURFACE FLOW
309	309	8				D	0.22	ADDITION OF SUBAREA C4
309	308	3	47.1	45.8	255.0			PIPE FLOW
308	308	8				D	0.51	ADDITION OF SUBAREA C5
308	307	3	45.8	44.1	335.0			PIPE FLOW
307	307	8				D	1.57	ADDITION OF SUBAREA C6
307	301	3	44.1	43.0	215.0			PIPE FLOW
301	301	1						CONFLUENCE 2 OF 2
301	300	3	39.8	39.7	35.0			PIPE FLOW

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

Fuscoe Engineering
 6390 Greenwich Drive
 Suite 170
 San Diego, CA 92122

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

* NEWPORT CROSSINGS *
 * PROPOSED CONDITION *
 * 2-YEAR STORM EVENT *

FILE NAME: 16181PR2.DAT

TIME/DATE OF STUDY: 09:54 08/29/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 2.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90

DATA BANK RAINFALL USED

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	24.0	18.0	0.180/0.180/0.020	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

16181PR2.RES

FLOW PROCESS FROM NODE 306.00 TO NODE 305.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
ELEVATION DATA: UPSTREAM(FEET) = 124.20 DOWNSTREAM(FEET) = 123.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.000
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
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.)
CONDOMINIUMS	D	0.10	0.20	0.350	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA RUNOFF(CFS) = 0.20
TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.20

FLOW PROCESS FROM NODE 305.00 TO NODE 304.00 IS CODE = 54

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 50.80
CHANNEL LENGTH THRU SUBAREA(FEET) = 60.00 CHANNEL SLOPE = 0.0200
CHANNEL BASE(FEET) = 100.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 0.20
FLOW VELOCITY(FEET/SEC.) = 0.41 FLOW DEPTH(FEET) = 0.00
TRAVEL TIME(MIN.) = 2.43 T_c (MIN.) = 7.43
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 304.00 = 125.00 FEET.

FLOW PROCESS FROM NODE 304.00 TO NODE 304.00 IS CODE = 81

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

=====

MAINLINE T_c (MIN.) = 7.43
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.804
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.59	0.20	0.350	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

16181PR2.RES

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.350$
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 0.92
 EFFECTIVE AREA(ACRES) = 0.69 AREA-AVERAGED F_m (INCH/HR) = 0.07
 AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED $A_p = 0.35$
 TOTAL AREA(ACRES) = 0.7 PEAK FLOW RATE(CFS) = 1.08

FLOW PROCESS FROM NODE 304.00 TO NODE 303.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(Feet) = 46.80 DOWNSTREAM(Feet) = 45.00
 FLOW LENGTH(Feet) = 445.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.0 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 2.73
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.08
 PIPE TRAVEL TIME(MIN.) = 2.72 T_c (MIN.) = 10.14
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 303.00 = 570.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

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

MAINLINE T_c (MIN.) = 10.14
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.508
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.49	0.20	0.350	75

 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.350$
 SUBAREA AREA(ACRES) = 0.49 SUBAREA RUNOFF(CFS) = 0.63
 EFFECTIVE AREA(ACRES) = 1.18 AREA-AVERAGED F_m (INCH/HR) = 0.07
 AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED $A_p = 0.35$
 TOTAL AREA(ACRES) = 1.2 PEAK FLOW RATE(CFS) = 1.53

FLOW PROCESS FROM NODE 303.00 TO NODE 302.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(Feet) = 45.00 DOWNSTREAM(Feet) = 44.10
 FLOW LENGTH(Feet) = 225.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.5 INCHES

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                                16181PR2.RES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.96
ESTIMATED PIPE DIAMETER(INCH) = 12.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.53
PIPE TRAVEL TIME(MIN.) = 1.27    Tc(MIN.) = 11.41
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 302.00 = 795.00 FEET.

*****
FLOW PROCESS FROM NODE 302.00 TO NODE 302.00 IS CODE = 81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 11.41
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.410
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/    SCS SOIL    AREA    Fp    Ap    SCS
LAND USE            GROUP    (ACRES) (INCH/HR) (DECIMAL) CN
CONDOMINIUMS        D        1.50    0.20    0.350    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA(ACRES) = 1.50    SUBAREA RUNOFF(CFS) = 1.81
EFFECTIVE AREA(ACRES) = 2.68    AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20    AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 2.7    PEAK FLOW RATE(CFS) = 3.23

*****
FLOW PROCESS FROM NODE 302.00 TO NODE 301.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 44.10    DOWNSTREAM(FEET) = 43.00
FLOW LENGTH(FEET) = 250.00    MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 10.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.68
ESTIMATED PIPE DIAMETER(INCH) = 15.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.23
PIPE TRAVEL TIME(MIN.) = 1.13    Tc(MIN.) = 12.54
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 301.00 = 1045.00 FEET.

*****
FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 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.) = 12.54
RAINFALL INTENSITY(INCH/HR) = 1.34

```

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                                16181PR2.RES
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.35
EFFECTIVE STREAM AREA(ACRES) = 2.68
TOTAL STREAM AREA(ACRES) = 2.68
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.23

*****
FLOW PROCESS FROM NODE 306.00 TO NODE 305.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 65.00
ELEVATION DATA: UPSTREAM(FEET) = 124.20 DOWNSTREAM(FEET) = 122.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS      Tc
    LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
CONDOMINIUMS           D       0.10    0.20    0.350    75    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA RUNOFF(CFS) = 0.20
TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.20

*****
FLOW PROCESS FROM NODE 305.00 TO NODE 309.00 IS CODE = 54
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 51.10
CHANNEL LENGTH THRU SUBAREA(FEET) = 75.00 CHANNEL SLOPE = 0.0120
CHANNEL BASE(FEET) = 100.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00
CHANNEL FLOW THRU SUBAREA(CFS) = 0.20
FLOW VELOCITY(FEET/SEC.) = 0.41 FLOW DEPTH(FEET) = 0.00
TRAVEL TIME(MIN.) = 3.03 Tc(MIN.) = 8.03
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 309.00 = 140.00 FEET.

*****
FLOW PROCESS FROM NODE 309.00 TO NODE 309.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====

```

16181PR2.RES

MAINLINE Tc(MIN.) = 8.03

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.724

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.22	0.20	0.350	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
 SUBAREA AREA(ACRES) = 0.22 SUBAREA RUNOFF(CFS) = 0.33
 EFFECTIVE AREA(ACRES) = 0.32 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 0.48

FLOW PROCESS FROM NODE 309.00 TO NODE 308.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 47.10 DOWNSTREAM(FEET) = 45.80
 FLOW LENGTH(FEET) = 255.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 4.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 2.42
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 0.48
 PIPE TRAVEL TIME(MIN.) = 1.76 Tc(MIN.) = 9.79
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 308.00 = 395.00 FEET.

FLOW PROCESS FROM NODE 308.00 TO NODE 308.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 9.79

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.539

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
CONDOMINIUMS	D	0.51	0.20	0.350	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
 SUBAREA AREA(ACRES) = 0.51 SUBAREA RUNOFF(CFS) = 0.67
 EFFECTIVE AREA(ACRES) = 0.83 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 0.8 PEAK FLOW RATE(CFS) = 1.10

FLOW PROCESS FROM NODE 308.00 TO NODE 307.00 IS CODE = 31


```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 45.80 DOWNSTREAM(FEET) = 44.10
FLOW LENGTH(FEET) = 335.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 7.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.88
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.10
PIPE TRAVEL TIME(MIN.) = 1.94 Tc(MIN.) = 11.73
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 307.00 = 730.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 307.00 IS CODE = 81

```

```

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

```

```

=====
MAINLINE Tc(MIN.) = 11.73
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.387
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
CONDOMINIUMS D 1.57 0.20 0.350 75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.350
SUBAREA AREA(ACRES) = 1.57 SUBAREA RUNOFF(CFS) = 1.86
EFFECTIVE AREA(ACRES) = 2.40 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
TOTAL AREA(ACRES) = 2.4 PEAK FLOW RATE(CFS) = 2.85

```

```

*****
FLOW PROCESS FROM NODE 307.00 TO NODE 301.00 IS CODE = 31

```

```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 44.10 DOWNSTREAM(FEET) = 43.00
FLOW LENGTH(FEET) = 215.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.80
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.85
PIPE TRAVEL TIME(MIN.) = 0.94 Tc(MIN.) = 12.67
LONGEST FLOWPATH FROM NODE 306.00 TO NODE 301.00 = 945.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 301.00 TO NODE 301.00 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.) = 12.67
 RAINFALL INTENSITY(INCH/HR) = 1.33
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 2.40
 TOTAL STREAM AREA(ACRES) = 2.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.85

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.23	12.54	1.335	0.20(0.07)	0.35	2.7	306.00
2	2.85	12.67	1.327	0.20(0.07)	0.35	2.4	306.00

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	6.07	12.54	1.335	0.20(0.07)	0.35	5.1	306.00
2	6.06	12.67	1.327	0.20(0.07)	0.35	5.1	306.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 6.07 Tc(MIN.) = 12.54
 EFFECTIVE AREA(ACRES) = 5.06 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.35
 TOTAL AREA(ACRES) = 5.1
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 301.00 = 1045.00 FEET.

FLOW PROCESS FROM NODE 301.00 TO NODE 300.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 39.80 DOWNSTREAM(FEET) = 39.70
 FLOW LENGTH(FEET) = 35.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.67
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

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PIPE-FLOW(CFS) = 6.07
 PIPE TRAVEL TIME(MIN.) = 0.16 Tc(MIN.) = 12.70
 LONGEST FLOWPATH FROM NODE 306.00 TO NODE 300.00 = 1080.00 FEET.

FLOW PROCESS FROM NODE 300.00 TO NODE 300.00 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.) = 12.70
 RAINFALL INTENSITY(INCH/HR) = 1.33
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.35
 EFFECTIVE STREAM AREA(ACRES) = 5.06
 TOTAL STREAM AREA(ACRES) = 5.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.07

FLOW PROCESS FROM NODE 203.00 TO NODE 202.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 145.00
 ELEVATION DATA: UPSTREAM(FEET) = 52.90 DOWNSTREAM(FEET) = 50.60

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 8.099
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.716
 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	D	0.10	0.20	0.850	75	8.10

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA RUNOFF(CFS) = 0.14
 TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.14

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81

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

=====

MAINLINE Tc(MIN.) = 8.10
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.716

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SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	D	0.16	0.20	0.850	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.16 SUBAREA RUNOFF(CFS) = 0.22
 EFFECTIVE AREA(ACRES) = 0.26 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 0.36

FLOW PROCESS FROM NODE 202.00 TO NODE 201.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 44.00 DOWNSTREAM(FEET) = 41.80
 FLOW LENGTH(FEET) = 220.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 6.0 INCH PIPE IS 3.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 2.90
 ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 0.36
 PIPE TRAVEL TIME(MIN.) = 1.26 Tc(MIN.) = 9.36
 LONGEST FLOWPATH FROM NODE 203.00 TO NODE 201.00 = 365.00 FEET.

FLOW PROCESS FROM NODE 201.00 TO NODE 201.00 IS CODE = 81

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

MAINLINE Tc(MIN.) = 9.36

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.579

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
PUBLIC PARK	D	0.35	0.20	0.850	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
 SUBAREA AREA(ACRES) = 0.35 SUBAREA RUNOFF(CFS) = 0.44
 EFFECTIVE AREA(ACRES) = 0.61 AREA-AVERAGED Fm(INCH/HR) = 0.17
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.85
 TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 0.77

FLOW PROCESS FROM NODE 201.00 TO NODE 300.00 IS CODE = 31

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

16181PR2.RES

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

```
=====
ELEVATION DATA: UPSTREAM(FEET) = 41.80 DOWNSTREAM(FEET) = 39.70
FLOW LENGTH(FEET) = 40.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 6.0 INCH PIPE IS 3.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.60
ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.77
PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 9.46
LONGEST FLOWPATH FROM NODE 203.00 TO NODE 300.00 = 405.00 FEET.
```

```
FLOW PROCESS FROM NODE 300.00 TO NODE 300.00 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.) = 9.46
RAINFALL INTENSITY(INCH/HR) = 1.57
AREA-AVERAGED Fm(INCH/HR) = 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.85
EFFECTIVE STREAM AREA(ACRES) = 0.61
TOTAL STREAM AREA(ACRES) = 0.61
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.77
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.07	12.70	1.326	0.20(0.07)	0.35	5.1	306.00
1	6.06	12.83	1.318	0.20(0.07)	0.35	5.1	306.00
2	0.77	9.46	1.569	0.20(0.17)	0.85	0.6	203.00

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	6.17	9.46	1.569	0.20(0.08)	0.42	4.4	203.00
2	6.70	12.70	1.326	0.20(0.08)	0.40	5.7	306.00
3	6.69	12.83	1.318	0.20(0.08)	0.40	5.7	306.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

```
PEAK FLOW RATE(CFS) = 6.70 Tc(MIN.) = 12.70
EFFECTIVE AREA(ACRES) = 5.67 AREA-AVERAGED Fm(INCH/HR) = 0.08
```

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AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.40

TOTAL AREA(ACRES) = 5.7

LONGEST FLOWPATH FROM NODE 306.00 TO NODE 300.00 = 1080.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 5.7 TC(MIN.) = 12.70

EFFECTIVE AREA(ACRES) = 5.67 AREA-AVERAGED Fm(INCH/HR)= 0.08

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.404

PEAK FLOW RATE(CFS) = 6.70

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.17	9.46	1.569	0.20(0.08)	0.42	4.4	203.00
2	6.70	12.70	1.326	0.20(0.08)	0.40	5.7	306.00
3	6.69	12.83	1.318	0.20(0.08)	0.40	5.7	306.00

=====

=====

END OF RATIONAL METHOD ANALYSIS

↑

Appendix 2

A.E.S. Unit Hydrograph Calculations and Low Loss Fraction Estimations

2-Year Existing Condition Y-bar Calculation.txt

NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm) AND LOW LOSS FRACTION ESTIMATIONS

=====

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Analysis prepared by:

Fuscoe Engineering
6390 Greenwich Dr
Suite 170
San Diego, CA 92122

Problem Descriptions:

NEWPORT CROSSINGS
2-YEAR DESIGN STORM EXISTING CONDITIONS
Y-BAR CALCULATION

=====

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.69	0.10	75.	0.200	0.889

TOTAL AREA (Acres) = 5.69

AREA-AVERAGED LOSS RATE, \bar{F}_m (in./hr.) = 0.000

AREA-AVERAGED LOW LOSS FRACTION, \bar{Y} = 0.111

=====

2-Year Existing Condition Hydrograph Calculation.txt

SMALL AREA UNIT HYDROGRAPH MODEL

=====

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Ver. 21.0 Release Date: 06/01/2014 License ID 1355

Analysis prepared by:

Fuscoe Engineering
6390 Greenwich Drive
Suite 170
San Diego, CA 92122

Problem Descriptions:

NEWPORT CROSSINGS

2-YEAR DESIGN STORM EXISTING CONDITION

HYDROGRAPH VOLUME CALCULATION

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90

TOTAL CATCHMENT AREA(ACRES) = 5.69

SOIL-LOSS RATE, F_m , (INCH/HR) = 0.020

LOW LOSS FRACTION = 0.111

TIME OF CONCENTRATION(MIN.) = 11.66

SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA

ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED

RETURN FREQUENCY(YEARS) = 2

5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19

30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40

1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53

3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89

6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22

24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.79

TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.18

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

2-Year Existing Condition Hydrograph Calculation.txt

0.06	0.0000	0.00	Q	.	.	.	.
0.26	0.0012	0.15	Q	.	.	.	.
0.45	0.0035	0.15	Q	.	.	.	.
0.65	0.0059	0.15	Q	.	.	.	.
0.84	0.0083	0.15	Q	.	.	.	.
1.04	0.0107	0.15	Q	.	.	.	.
1.23	0.0131	0.15	Q	.	.	.	.
1.43	0.0156	0.15	Q	.	.	.	.
1.62	0.0181	0.15	Q	.	.	.	.
1.81	0.0206	0.16	Q	.	.	.	.
2.01	0.0231	0.16	Q	.	.	.	.
2.20	0.0256	0.16	Q	.	.	.	.
2.40	0.0282	0.16	Q	.	.	.	.
2.59	0.0307	0.16	Q	.	.	.	.
2.79	0.0333	0.16	Q	.	.	.	.
2.98	0.0360	0.16	Q	.	.	.	.
3.17	0.0386	0.17	Q	.	.	.	.
3.37	0.0413	0.17	Q	.	.	.	.
3.56	0.0440	0.17	Q	.	.	.	.
3.76	0.0467	0.17	Q	.	.	.	.
3.95	0.0495	0.17	Q	.	.	.	.
4.15	0.0523	0.17	Q	.	.	.	.
4.34	0.0551	0.18	Q	.	.	.	.
4.53	0.0579	0.18	Q	.	.	.	.
4.73	0.0608	0.18	Q	.	.	.	.
4.92	0.0637	0.18	Q	.	.	.	.
5.12	0.0666	0.18	Q	.	.	.	.
5.31	0.0696	0.19	Q	.	.	.	.
5.51	0.0726	0.19	Q	.	.	.	.
5.70	0.0756	0.19	Q	.	.	.	.
5.89	0.0787	0.19	Q	.	.	.	.
6.09	0.0818	0.19	Q	.	.	.	.
6.28	0.0849	0.20	Q	.	.	.	.
6.48	0.0881	0.20	Q	.	.	.	.
6.67	0.0913	0.20	Q	.	.	.	.
6.87	0.0946	0.20	Q	.	.	.	.
7.06	0.0979	0.21	Q	.	.	.	.
7.26	0.1013	0.21	Q	.	.	.	.
7.45	0.1047	0.21	Q	.	.	.	.
7.64	0.1081	0.22	Q	.	.	.	.
7.84	0.1116	0.22	Q	.	.	.	.
8.03	0.1151	0.22	Q	.	.	.	.
8.23	0.1187	0.23	Q	.	.	.	.
8.42	0.1224	0.23	Q	.	.	.	.
8.62	0.1261	0.23	Q	.	.	.	.
8.81	0.1299	0.24	Q	.	.	.	.
9.00	0.1337	0.24	Q	.	.	.	.
9.20	0.1376	0.25	Q	.	.	.	.

2-Year Existing Condition Hydrograph Calculation.txt

9.39	0.1416	0.25	Q	.	.	.	.
9.59	0.1456	0.25	.Q	.	.	.	.
9.78	0.1497	0.26	.Q	.	.	.	.
9.98	0.1539	0.26	.Q	.	.	.	.
10.17	0.1582	0.27	.Q	.	.	.	.
10.36	0.1626	0.28	.Q	.	.	.	.
10.56	0.1670	0.28	.Q	.	.	.	.
10.75	0.1716	0.29	.Q	.	.	.	.
10.95	0.1763	0.29	.Q	.	.	.	.
11.14	0.1810	0.30	.Q	.	.	.	.
11.34	0.1859	0.31	.Q	.	.	.	.
11.53	0.1909	0.32	.Q	.	.	.	.
11.72	0.1961	0.32	.Q	.	.	.	.
11.92	0.2014	0.34	.Q	.	.	.	.
12.11	0.2068	0.34	.Q	.	.	.	.
12.31	0.2130	0.43	.Q	.	.	.	.
12.50	0.2200	0.44	.Q	.	.	.	.
12.70	0.2272	0.46	.Q	.	.	.	.
12.89	0.2347	0.47	.Q	.	.	.	.
13.09	0.2424	0.49	.Q	.	.	.	.
13.28	0.2503	0.50	. Q	.	.	.	.
13.47	0.2586	0.53	. Q	.	.	.	.
13.67	0.2671	0.54	. Q	.	.	.	.
13.86	0.2761	0.57	. Q	.	.	.	.
14.06	0.2854	0.59	. Q	.	.	.	.
14.25	0.2955	0.66	. Q	.	.	.	.
14.45	0.3063	0.68	. Q	.	.	.	.
14.64	0.3178	0.74	. Q	.	.	.	.
14.83	0.3300	0.78	. Q	.	.	.	.
15.03	0.3434	0.88	. Q	.	.	.	.
15.22	0.3580	0.95	. Q	.	.	.	.
15.42	0.3746	1.11	. Q	.	.	.	.
15.61	0.3922	1.09	. Q	.	.	.	.
15.81	0.4141	1.62	. Q	.	.	.	.
16.00	0.4453	2.27	. Q.	.	.	.	.
16.19	0.5199	7.02	.	.	Q	.	.
16.39	0.5866	1.29	. Q	.	.	.	.
16.58	0.6052	1.03	. Q	.	.	.	.
16.78	0.6201	0.82	. Q	.	.	.	.
16.97	0.6324	0.71	. Q	.	.	.	.
17.17	0.6432	0.62	. Q	.	.	.	.
17.36	0.6527	0.56	. Q	.	.	.	.
17.55	0.6612	0.51	. Q	.	.	.	.
17.75	0.6692	0.48	.Q	.	.	.	.
17.94	0.6766	0.45	.Q	.	.	.	.
18.14	0.6836	0.41	.Q	.	.	.	.
18.33	0.6895	0.33	.Q	.	.	.	.
18.53	0.6947	0.31	.Q	.	.	.	.

2-Year Existing Condition Hydrograph Calculation.txt

18.72	0.6996	0.30	.Q	.	.	.	.
18.92	0.7043	0.28	.Q	.	.	.	.
19.11	0.7087	0.27	.Q	.	.	.	.
19.30	0.7130	0.26	.Q	.	.	.	.
19.50	0.7171	0.25	.Q	.	.	.	.
19.69	0.7211	0.24	Q	.	.	.	.
19.89	0.7249	0.23	Q	.	.	.	.
20.08	0.7286	0.23	Q	.	.	.	.
20.28	0.7322	0.22	Q	.	.	.	.
20.47	0.7357	0.21	Q	.	.	.	.
20.66	0.7391	0.21	Q	.	.	.	.
20.86	0.7424	0.20	Q	.	.	.	.
21.05	0.7457	0.20	Q	.	.	.	.
21.25	0.7488	0.19	Q	.	.	.	.
21.44	0.7519	0.19	Q	.	.	.	.
21.64	0.7549	0.18	Q	.	.	.	.
21.83	0.7578	0.18	Q	.	.	.	.
22.02	0.7607	0.18	Q	.	.	.	.
22.22	0.7635	0.17	Q	.	.	.	.
22.41	0.7662	0.17	Q	.	.	.	.
22.61	0.7689	0.17	Q	.	.	.	.
22.80	0.7716	0.16	Q	.	.	.	.
23.00	0.7742	0.16	Q	.	.	.	.
23.19	0.7768	0.16	Q	.	.	.	.
23.38	0.7793	0.16	Q	.	.	.	.
23.58	0.7817	0.15	Q	.	.	.	.
23.77	0.7842	0.15	Q	.	.	.	.
23.97	0.7866	0.15	Q	.	.	.	.
24.16	0.7889	0.15	Q	.	.	.	.
24.36	0.7901	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1445.8
10%	151.6
20%	35.0
30%	23.3
40%	11.7
50%	11.7
60%	11.7
70%	11.7
80%	11.7

2-Year Existing Condition Hydrograph Calculation.txt
90% 11.7

2-Year Proposed Condition Y-bar Calculation.txt

NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm) AND LOW LOSS FRACTION ESTIMATIONS

=====

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Ver. 21.0 Release Date: 06/01/2014 License ID 1355

Analysis prepared by:

Fuscoe Engineering
6390 Greenwich Dr
Suite 170
San Diego, CA 92122

Problem Descriptions:

NEWPORT CROSSINGS
2-YEAR DESIGN STORM PROPOSED CONDITIONS
Y-BAR CALCULATION

=====

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	5.08	0.35	75.	0.200	0.887
2	0.61	0.85	75.	0.200	0.884

TOTAL AREA (Acres) = 5.69

AREA-AVERAGED LOSS RATE, \bar{F}_m (in./hr.) = 0.001

AREA-AVERAGED LOW LOSS FRACTION, \bar{Y} = 0.113

=====

2-Year Proposed Condition Hydrograph Calculation.txt

SMALL AREA UNIT HYDROGRAPH MODEL

=====

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Ver. 21.0 Release Date: 06/01/2014 License ID 1355

Analysis prepared by:

Fuscoe Engineering
6390 Greenwich Drive
Suite 170
San Diego, CA 92122

Problem Descriptions:

NEWPORT CROSSINGS

2-YEAR DESIGN STORM PROPOSED CONDITIONS

HYDROGRAPH VOLUME CALCULATION

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90

TOTAL CATCHMENT AREA(ACRES) = 5.69

SOIL-LOSS RATE, F_m , (INCH/HR) = 0.080

LOW LOSS FRACTION = 0.113

TIME OF CONCENTRATION(MIN.) = 12.72

SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA

ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED

RETURN FREQUENCY(YEARS) = 2

5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19

30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40

1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53

3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89

6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22

24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.78

TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.19

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

2-Year Proposed Condition Hydrograph Calculation.txt

0.10	0.0006	0.15	Q	.	.	.	.
0.31	0.0032	0.15	Q	.	.	.	.
0.52	0.0057	0.15	Q	.	.	.	.
0.74	0.0083	0.15	Q	.	.	.	.
0.95	0.0109	0.15	Q	.	.	.	.
1.16	0.0136	0.15	Q	.	.	.	.
1.37	0.0162	0.15	Q	.	.	.	.
1.58	0.0189	0.15	Q	.	.	.	.
1.80	0.0216	0.16	Q	.	.	.	.
2.01	0.0243	0.16	Q	.	.	.	.
2.22	0.0271	0.16	Q	.	.	.	.
2.43	0.0299	0.16	Q	.	.	.	.
2.64	0.0327	0.16	Q	.	.	.	.
2.86	0.0355	0.16	Q	.	.	.	.
3.07	0.0384	0.16	Q	.	.	.	.
3.28	0.0413	0.17	Q	.	.	.	.
3.49	0.0442	0.17	Q	.	.	.	.
3.70	0.0472	0.17	Q	.	.	.	.
3.92	0.0502	0.17	Q	.	.	.	.
4.13	0.0532	0.17	Q	.	.	.	.
4.34	0.0563	0.18	Q	.	.	.	.
4.55	0.0594	0.18	Q	.	.	.	.
4.76	0.0625	0.18	Q	.	.	.	.
4.98	0.0656	0.18	Q	.	.	.	.
5.19	0.0688	0.18	Q	.	.	.	.
5.40	0.0721	0.19	Q	.	.	.	.
5.61	0.0754	0.19	Q	.	.	.	.
5.82	0.0787	0.19	Q	.	.	.	.
6.04	0.0820	0.19	Q	.	.	.	.
6.25	0.0855	0.20	Q	.	.	.	.
6.46	0.0889	0.20	Q	.	.	.	.
6.67	0.0924	0.20	Q	.	.	.	.
6.88	0.0960	0.20	Q	.	.	.	.
7.10	0.0996	0.21	Q	.	.	.	.
7.31	0.1032	0.21	Q	.	.	.	.
7.52	0.1069	0.21	Q	.	.	.	.
7.73	0.1107	0.22	Q	.	.	.	.
7.94	0.1145	0.22	Q	.	.	.	.
8.16	0.1184	0.22	Q	.	.	.	.
8.37	0.1224	0.23	Q	.	.	.	.
8.58	0.1264	0.23	Q	.	.	.	.
8.79	0.1305	0.23	Q	.	.	.	.
9.00	0.1346	0.24	Q	.	.	.	.
9.22	0.1389	0.24	Q	.	.	.	.
9.43	0.1432	0.25	.Q	.	.	.	.
9.64	0.1476	0.25	.Q	.	.	.	.
9.85	0.1521	0.26	.Q	.	.	.	.
10.06	0.1567	0.26	.Q	.	.	.	.

2-Year Proposed Condition Hydrograph Calculation.txt

10.28	0.1614	0.27	.Q	.	.	.	.
10.49	0.1662	0.28	.Q	.	.	.	.
10.70	0.1711	0.29	.Q	.	.	.	.
10.91	0.1762	0.29	.Q	.	.	.	.
11.12	0.1814	0.30	.Q	.	.	.	.
11.34	0.1867	0.31	.Q	.	.	.	.
11.55	0.1921	0.32	.Q	.	.	.	.
11.76	0.1977	0.32	.Q	.	.	.	.
11.97	0.2035	0.34	.Q	.	.	.	.
12.18	0.2097	0.37	.Q	.	.	.	.
12.40	0.2167	0.44	.Q	.	.	.	.
12.61	0.2244	0.44	.Q	.	.	.	.
12.82	0.2324	0.47	.Q	.	.	.	.
13.03	0.2406	0.48	.Q	.	.	.	.
13.24	0.2492	0.50	. Q	.	.	.	.
13.46	0.2581	0.51	. Q	.	.	.	.
13.67	0.2674	0.55	. Q	.	.	.	.
13.88	0.2771	0.56	. Q	.	.	.	.
14.09	0.2874	0.61	. Q	.	.	.	.
14.30	0.2984	0.65	. Q	.	.	.	.
14.52	0.3104	0.71	. Q	.	.	.	.
14.73	0.3231	0.74	. Q	.	.	.	.
14.94	0.3369	0.83	. Q	.	.	.	.
15.15	0.3520	0.89	. Q	.	.	.	.
15.36	0.3690	1.05	. Q	.	.	.	.
15.58	0.3874	1.05	. Q	.	.	.	.
15.79	0.4093	1.45	. Q	.	.	.	.
16.00	0.4395	2.00	. Q	.	.	.	.
16.21	0.5127	6.36	.	.	Q	.	.
16.42	0.5786	1.17	. Q	.	.	.	.
16.64	0.5973	0.96	. Q	.	.	.	.
16.85	0.6126	0.79	. Q	.	.	.	.
17.06	0.6254	0.68	. Q	.	.	.	.
17.27	0.6365	0.58	. Q	.	.	.	.
17.48	0.6462	0.53	. Q	.	.	.	.
17.70	0.6551	0.49	.Q	.	.	.	.
17.91	0.6634	0.45	.Q	.	.	.	.
18.12	0.6711	0.43	.Q	.	.	.	.
18.33	0.6777	0.33	.Q	.	.	.	.
18.54	0.6834	0.31	.Q	.	.	.	.
18.76	0.6887	0.29	.Q	.	.	.	.
18.97	0.6937	0.28	.Q	.	.	.	.
19.18	0.6985	0.27	.Q	.	.	.	.
19.39	0.7031	0.26	.Q	.	.	.	.
19.60	0.7075	0.25	Q	.	.	.	.
19.82	0.7118	0.24	Q	.	.	.	.
20.03	0.7159	0.23	Q	.	.	.	.
20.24	0.7198	0.22	Q	.	.	.	.

2-Year Proposed Condition Hydrograph Calculation.txt

20.45	0.7237	0.21	Q
20.66	0.7274	0.21	Q	.	.	.	.
20.88	0.7310	0.20	Q	.	.	.	.
21.09	0.7345	0.20	Q	.	.	.	.
21.30	0.7379	0.19	Q	.	.	.	.
21.51	0.7412	0.19	Q	.	.	.	.
21.72	0.7444	0.18	Q	.	.	.	.
21.94	0.7476	0.18	Q	.	.	.	.
22.15	0.7507	0.17	Q	.	.	.	.
22.36	0.7537	0.17	Q	.	.	.	.
22.57	0.7567	0.17	Q	.	.	.	.
22.78	0.7596	0.16	Q	.	.	.	.
23.00	0.7624	0.16	Q	.	.	.	.
23.21	0.7652	0.16	Q	.	.	.	.
23.42	0.7679	0.15	Q	.	.	.	.
23.63	0.7706	0.15	Q	.	.	.	.
23.84	0.7733	0.15	Q	.	.	.	.
24.06	0.7758	0.15	Q	.	.	.	.
24.27	0.7771	0.00	Q	.	.	.	.

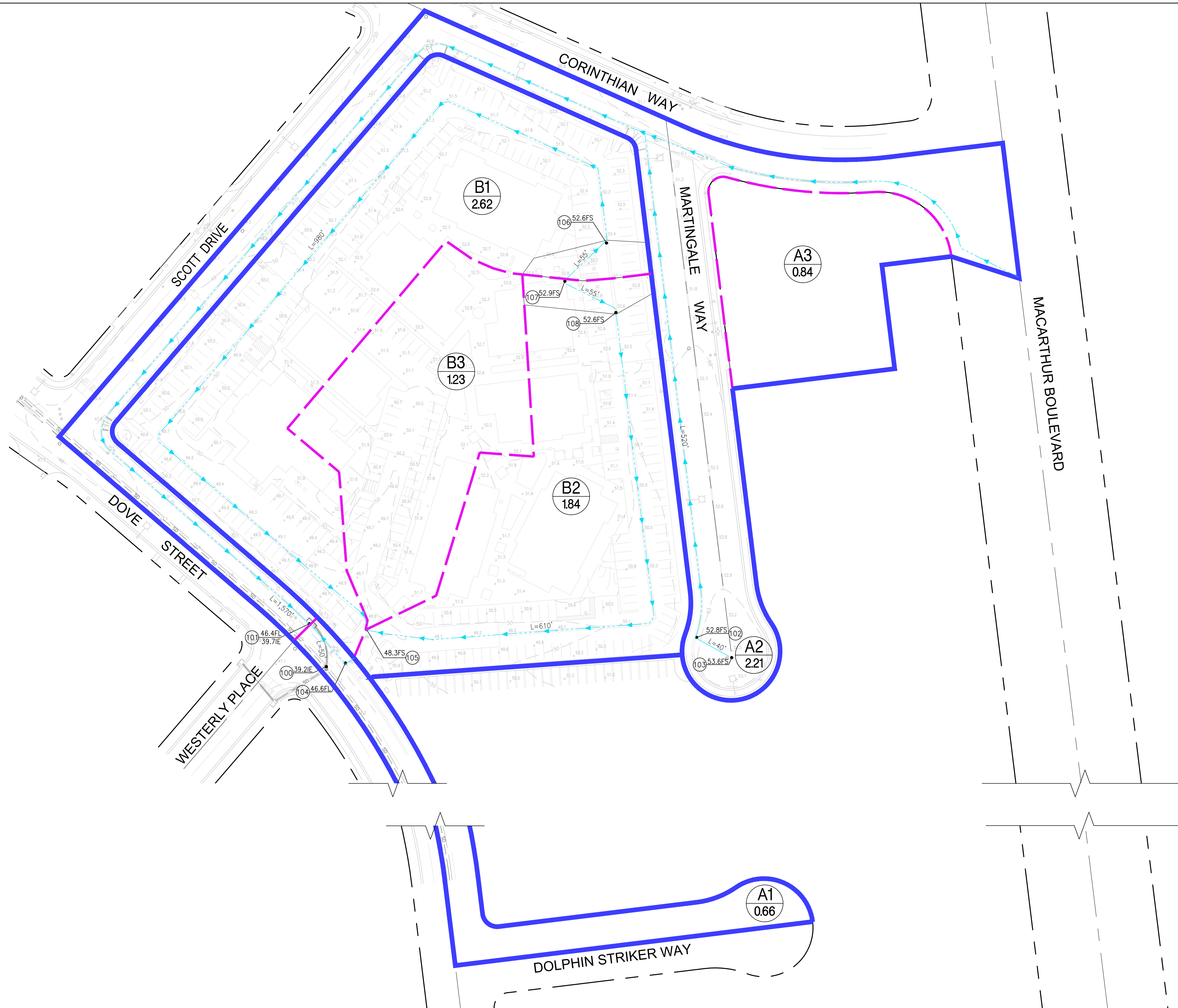
TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1450.1
10%	178.1
20%	38.2
30%	25.4
40%	12.7
50%	12.7
60%	12.7
70%	12.7
80%	12.7
90%	12.7

Appendix 3

Existing and Proposed Condition

Hydrology Maps



LEGEND

- MAJOR BOUNDARY/MAJOR BOUNDARY
- SUB AREA BOUNDARY
- FLOW PATH
- DRAINAGE AREA DESIGNATION
- ACRES
- HYDROLOGIC NODE

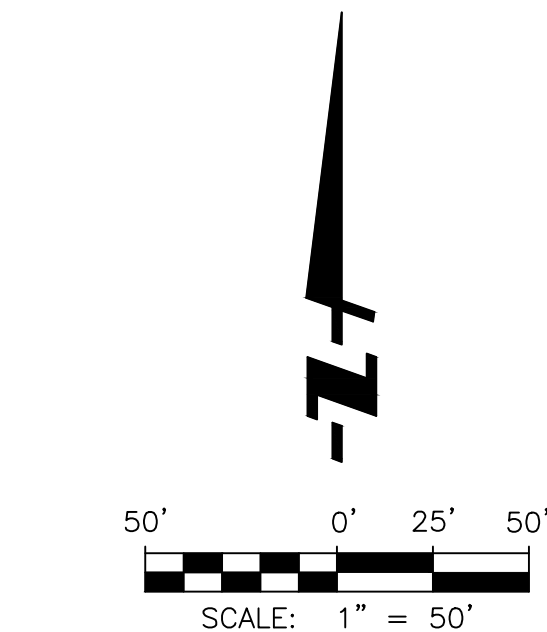
SUMMARY

EXISTING CONDITION 2-YEAR STORM/24 HR.				
DESCRIPTION	HYDROLOGIC NODE	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)	Tc (Minutes)
ONSITE	104	5.69	6.72	11.66

EXISTING CONDITION 25-YEAR STORM/24 HR.				
DESCRIPTION	HYDROLOGIC NODE	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)	Tc (Minutes)
ONSITE	104	5.69	15.09	10.68
PUBLIC SD	100	9.41	23.73	12.32

SOIL TYPE D
PROJECT BOUNDARY AREA = 5.69 AC
OFFSITE WATER SHED AREA = 3.72 AC
TOTAL = 9.41 AC

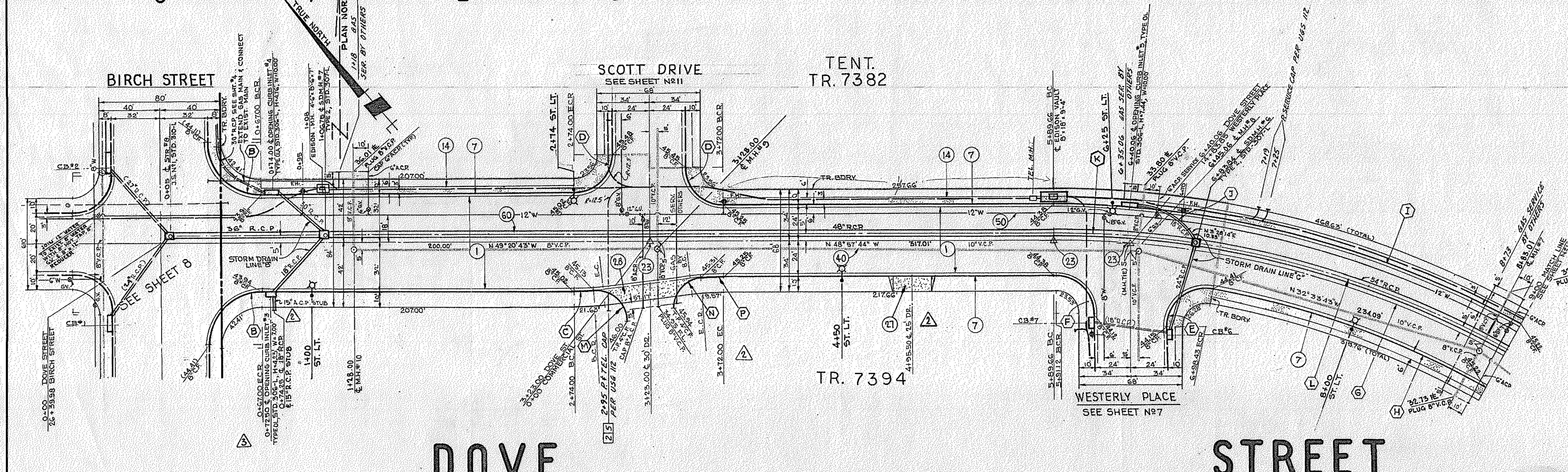
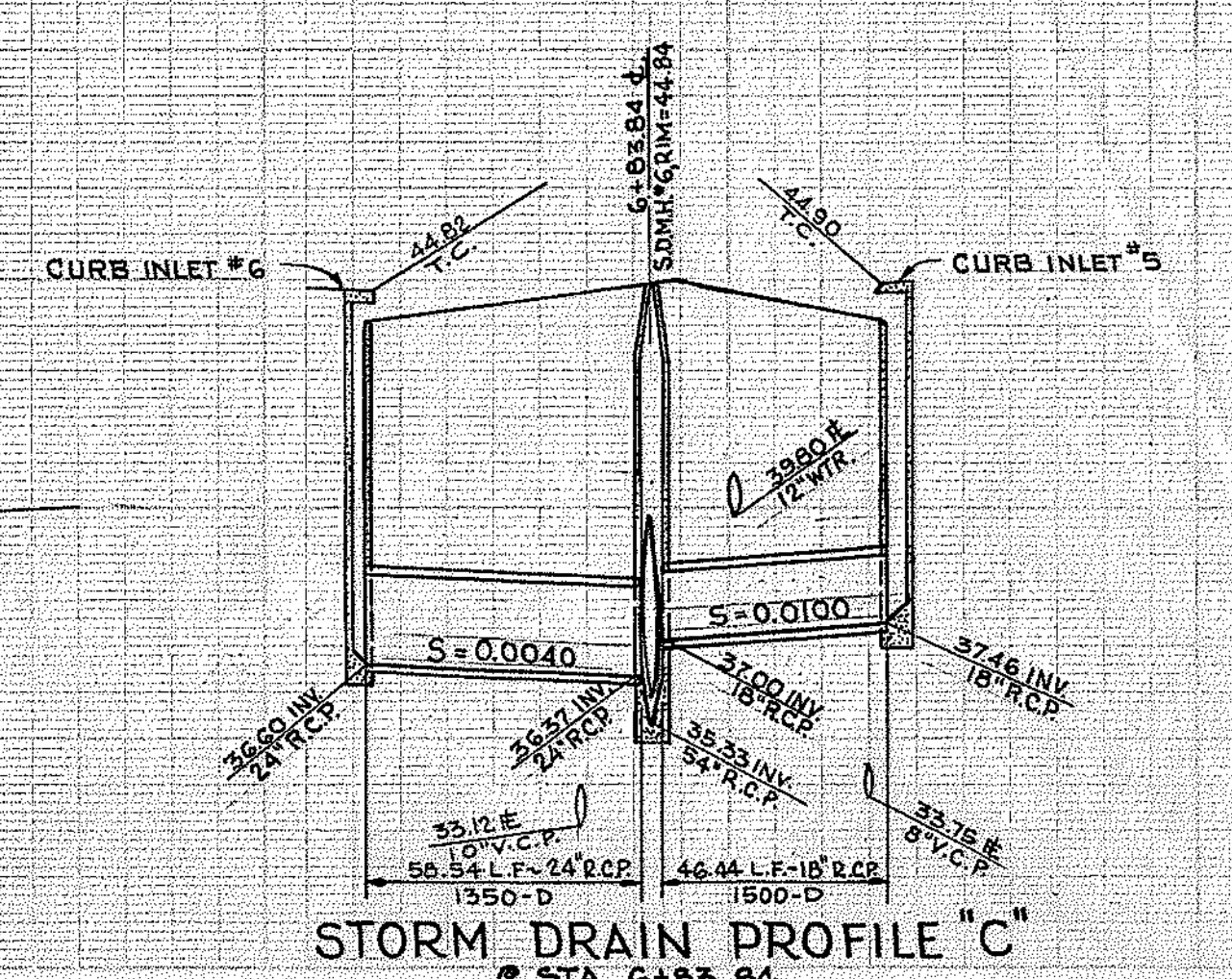
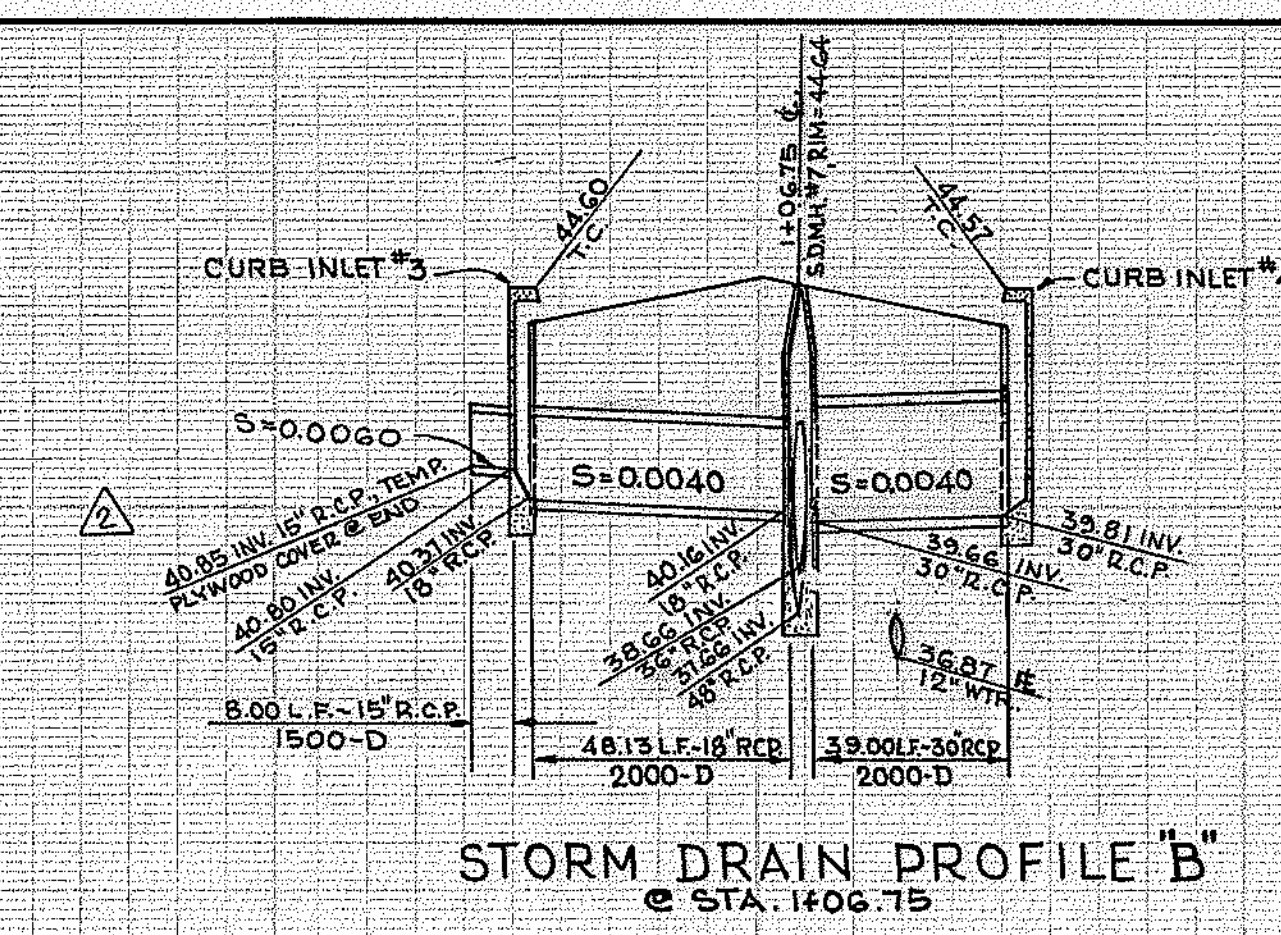
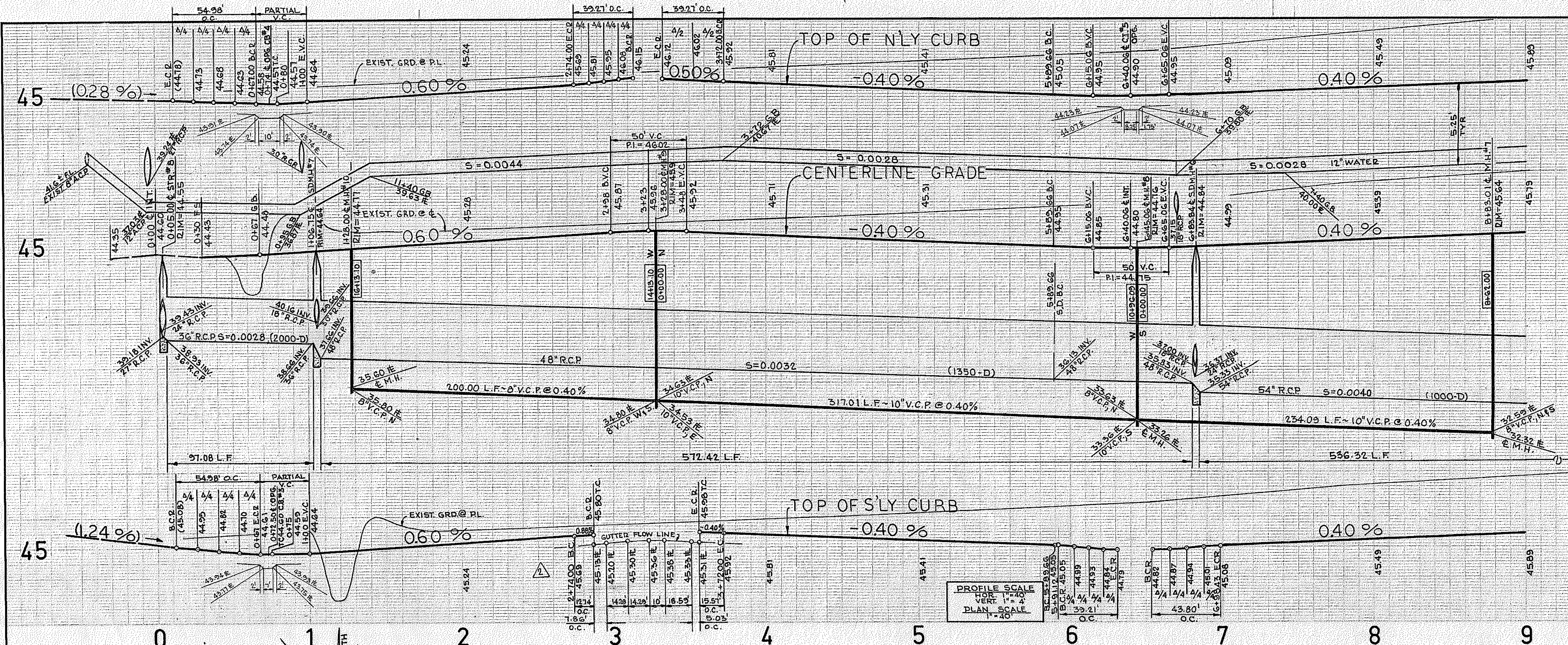
EXISTING HYDROLOGY
NEWPORT CROSSINGS-NEWPORT BEACH



FUSCOE
ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315 • www.fuscoe.com

Appendix 4

RECORD STREET IMPROVEMENT PLANS



DOVE

STREET

STORM DRAIN

Δ = 6° 55' 31" R = 605.00	L = 94.91	T = 47.43
Δ = 55° 11' 25" R = 605.00	L = 352.22	T = 191.26
Δ = 95° 38' 55" R = 20.00	L = 32.43	T = 21.52
Δ = 65° 32' 24" R = 20.00	L = 29.86	T = 18.50
Δ = 4° 17' 36" R = 200.00	L = 15.51	T = 7.79

CURVE DATA

Δ = 90° 00' 00" R = 35.00	L = 54.98	T = 35.00
Δ = 3° 38' 55" R = 200.00	L = 12.74	T = 6.31
Δ = 90° 00' 00" R = 25.00	L = 39.27	T = 25.00
Δ = 100° 23' 11" R = 25.00	L = 43.80	T = 30.00
Δ = 89° 51' 40" R = 25.00	L = 32.11	T = 24.94
Δ = 42° 12' 02" R = 600.00	L = 443.49	T = 232.43
Δ = 31° 57' 51" R = 576.00	L = 321.34	T = 321.34
Δ = 42° 12' 02" R = 624.00	L = 461.23	T = 241.71
Δ = 48° 12' 34" R = 450.00	L = 37.86	T = 201.3

RAUB & BEIN & FROST AND ASSOCIATES
 CIVIL AND STRUCTURAL ENGINEERS
 LAND SURVEYORS AND PLANNERS
 136 ROCHESTER STREET
 COSTA MESA, CALIFORNIA
 TEL: (714) 548-7723
 (714) 542-1022
 DATE: 6-10-71
 RCE NO. 14749

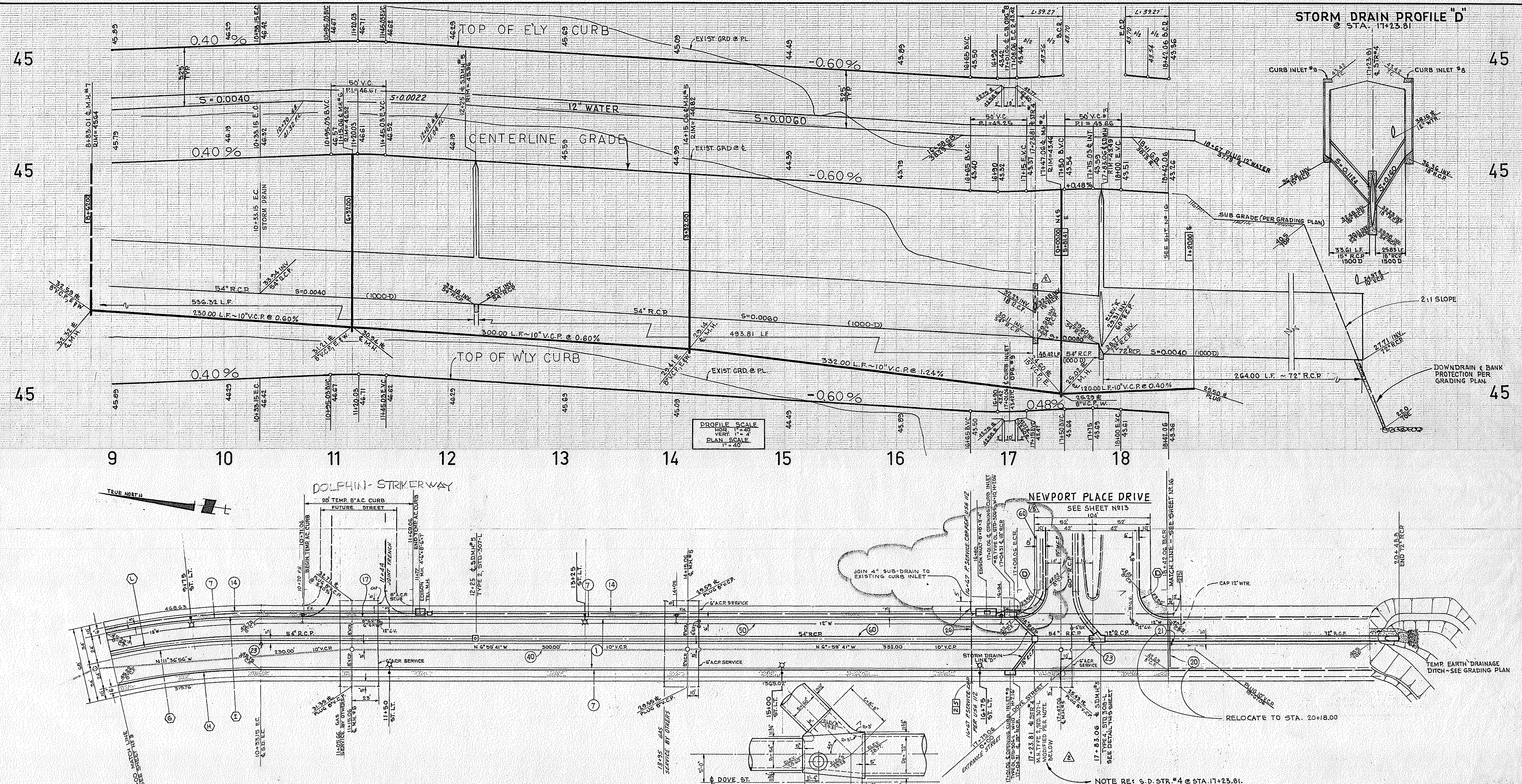
DATE	BY	DESCRIPTION	APPROVED	DATE
7-16-71	J.P.N.	ADDED ST. LIGHTS	J.D.	7-30-71
7-27-71	J.P.N.	CORRECTED TERMINOLOGY @ S.D. CURB INLETS #3 & #4	DDN	7-27-71
7-1-71	J.P.N.	ADDED STORM DRAIN STUB AND P.C.C. DOWNWAY APPROACHES	DDN	7-2-71
6-30-71	J.P.N.	RELOCATE ALL F.H.'S TO BACK OF CURB	DDN	7-2-71

PLAN AND PROFILE FOR THE IMPROVEMENT OF
DOVE STREET
 TRACT No 1394
 CITY OF NEWPORT BEACH
 PUBLIC WORKS DEPARTMENT

SHEET
9
 OF 16

TRACT 1394
 SH 9 of 16

Tr 7394, 7382 sh.9



TRACT 7394
SH 10 of 16

RAUB & BEIN & FROST
AND ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
LAND SURVEYORS AND PLANNERS
136 ROCHESTER STREET
COSTA MESA, CALIFORNIA
TEL: (714) 548-7723
(714) 542-1022

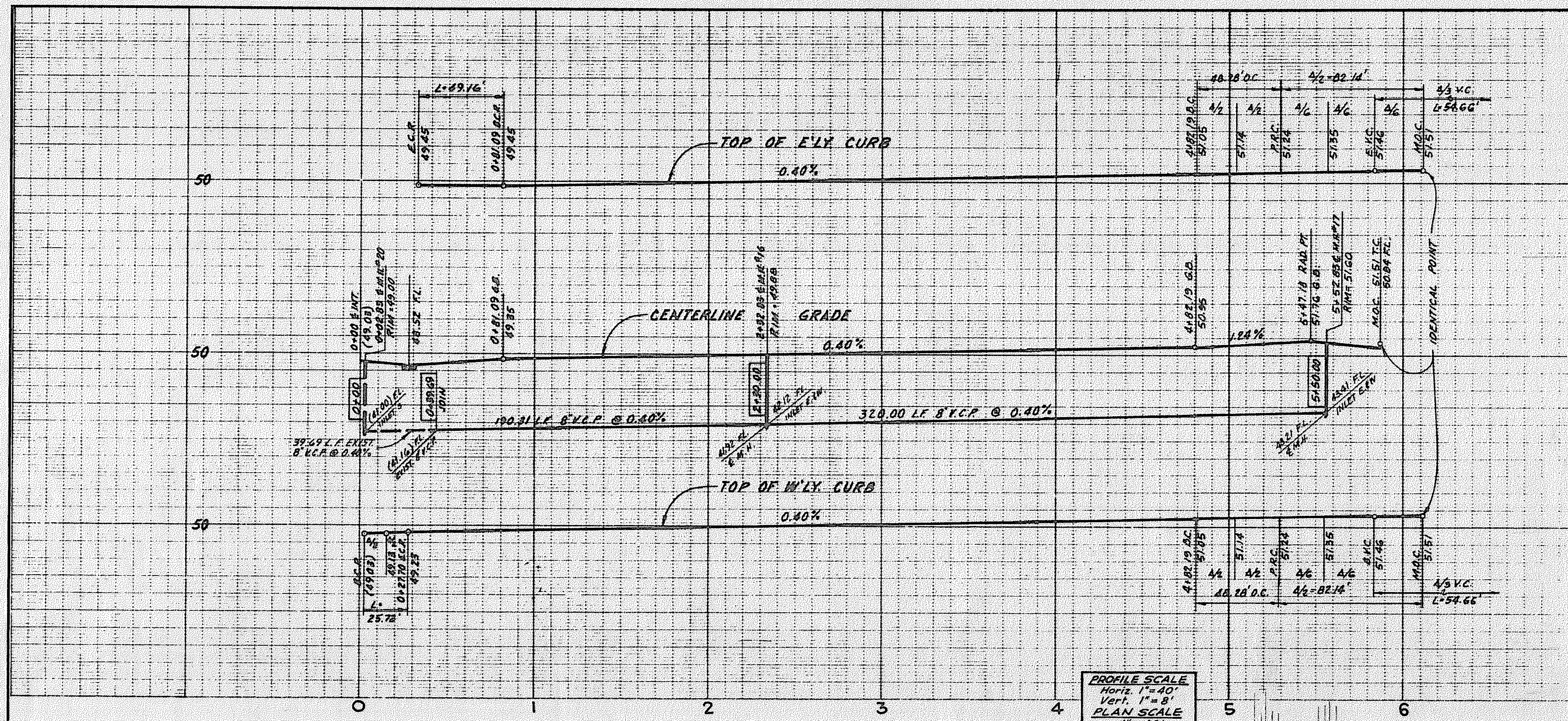
DATE 6-10-71
RCE NO. 14749

DATE	BY	DESCRIPTION	APPRD.	DATE
10-18-72	J.W.W.	ADDED SUB-DRAIN IN NEWPORT PLACE DRIVE		
10-15-71	J.W.U.	REVISED FOR CONTINUATION OF DOVE STREET		
7-10-71	J.P.N.	ADDED ST. LIGHTS		
7-12-71	J.P.N.	REVISED S.D. J.S. #4		
6-30-71	J.P.N.	RELOCATE ALL F.W.'S TO BACK OF CURB		

APPROVED	DATE
<i>[Signature]</i>	6-17-71
PUBLIC WORKS DIRECTOR	
DESIGNED	DATE
J.P.N.	7-27-71
CHECKED	DATE
J.P.N.	APRIL 1971

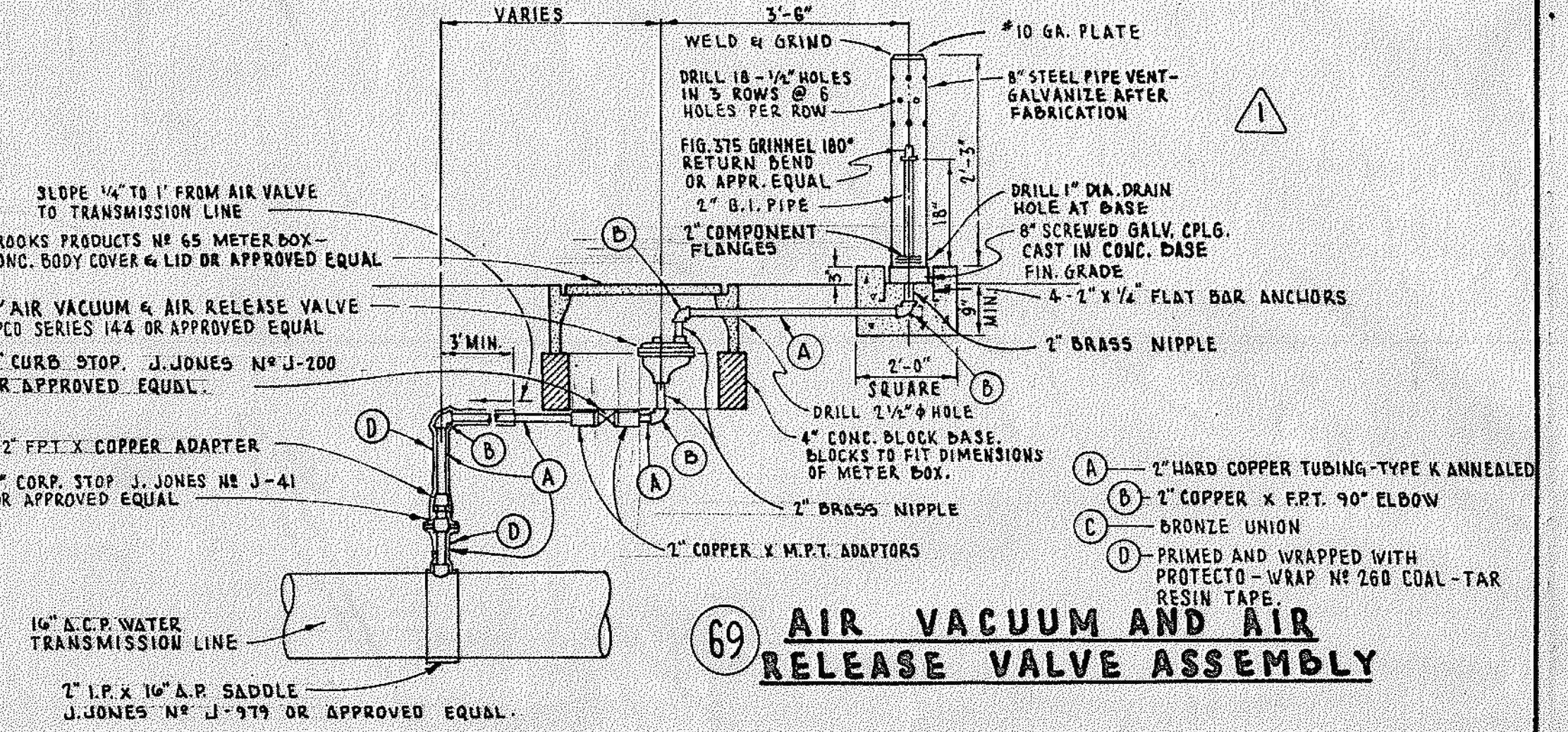
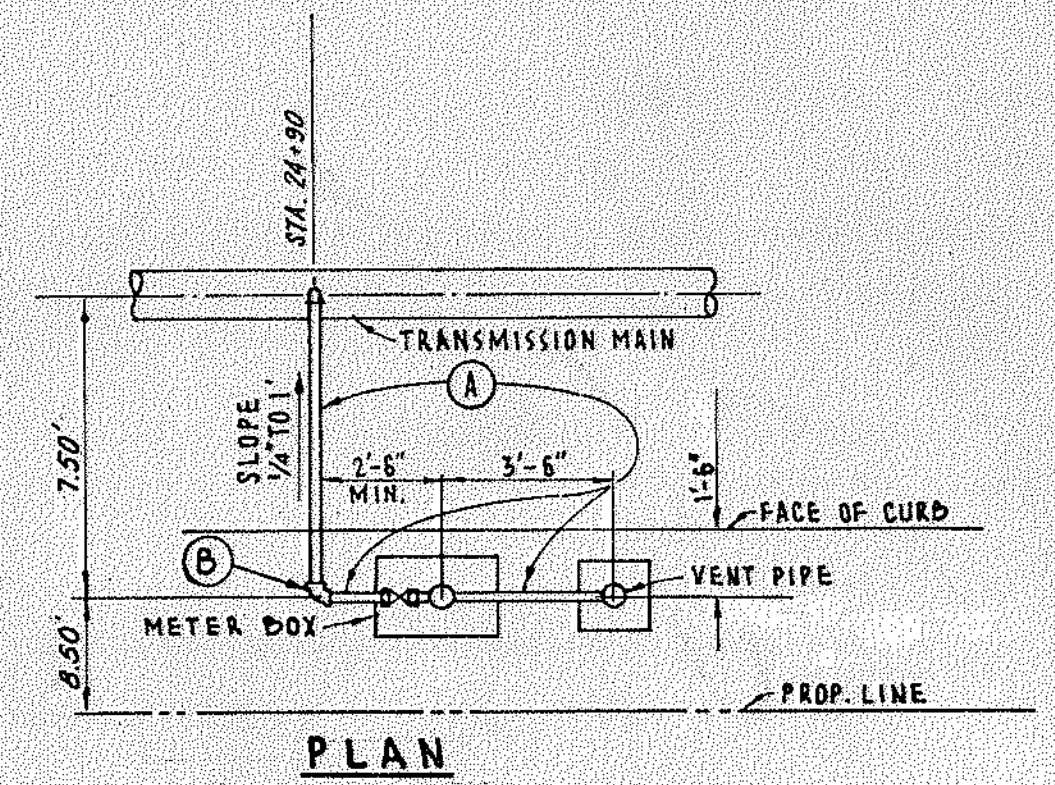
PLAN AND PROFILE FOR THE IMPROVEMENT OF
DOVE STREET
TENT. TRACT 7382
CITY OF NEWPORT BEACH
PUBLIC WORKS DEPARTMENT

SHEET
10
OF 16

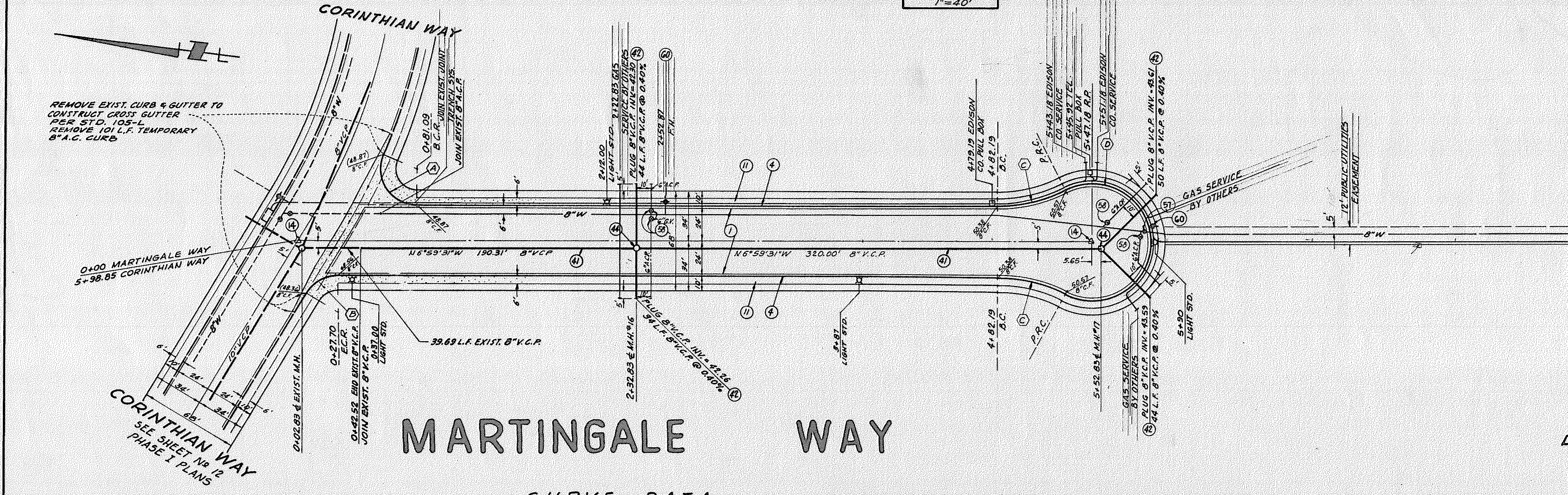


NOTES:

- 1- SILVER SOLDER ALL TUBING
- 2- A COPPER X COPPER UNION MAY BE INSERTED ANY PLACE ABOVE THE
- 2" J. JONES N° J-979



69 AIR VACUUM AND AIR RELEASE VALVE ASSEMBLY



MARTINGALE WAY

CURVE DATA

- | | | | | |
|---|-----------------------------|-------------|-------------|------------|
| A | $\Delta=112^{\circ}39'44''$ | $R=25.00'$ | $L=49.16'$ | $T=37.53'$ |
| B | $\Delta=55^{\circ}57'19''$ | $R=25.00'$ | $L=25.72'$ | $T=14.13'$ |
| C | $\Delta=27^{\circ}33'38''$ | $R=100.00'$ | $L=48.28'$ | $T=24.02'$ |
| D | $\Delta=235^{\circ}19'16''$ | $R=40.00'$ | $L=164.28'$ | |

RAUB • BEIN • FROST AND ASSOCIATES
 CIVIL AND STRUCTURAL ENGINEERS
 LAND SURVEYORS AND PLANNERS
 136 ROCHESTER STREET
 COSTA MESA, CALIFORNIA
 TEL: (714) 548-7723
 (714) 542-1022
 DATE: 3-14-72
 RCE NO. 14749

DATE	BY	DESCRIPTION	APPD.	DATE

APPROVED: *[Signature]*
 1537. PUBLIC WORKS DIRECTOR
 R.C.E. NO. 12804
 DATE: 3-14-72
 FIELD BOOK: AS SHOWN
 DESIGNED: R.M.G.
 CHECKED: J.U.
 SCALE: 8"=1'
 DATE: DEC. '71

PLAN AND PROFILE FOR THE IMPROVEMENT OF
MARTINGALE WAY
 FROM CORINTHIAN WAY TO STA. 4+62.83
 TENTATIVE TRACT N° 7382 PHASE II
 CITY OF NEWPORT BEACH
 PUBLIC WORKS DEPARTMENT

SHEET **10** OF 13

TRACT 7382, 7694, 7770
 SHEET 10 of 13