

PROJECT REPORT

City of Santee Citywide Drainage Study

Presented to:

City of Santee

February 1990

BSI CONSULTANTS, INC.

BSI CONSULTANTS, INC.

February 2, 1990

Mr. Al H. Krier, P.E.
Director of Public Works
10765 Woodside Avenue
Santee, CA 92071-3198

Subject: City-Wide Drainage Study - Project Report

Dear Mr. Krier:

The attached project report for the City-Wide Drainage Study is final and includes all appropriate revisions suggested by the City staff.

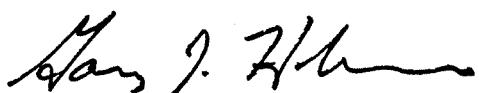
We appreciate being of assistance to the City on this important project. If you have further questions, please let us know.

Sincerely,

BSI CONSULTANTS, INC.



Neal D. Brown
Project Engineer/Manager



Gary J. Hobson; P.E.
Principal-in-Charge



NDB/lew
reports/santee/santedr.ndb

cc: Jeff Cooper

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ACKNOWLEDGEMENT

The completion of this project report for the City-Wide Drainage Study was achieved through the guidance and expertise provided by the City of Santee, in particular Mr. Al H. Krier, P.E., Director of Public Works; Mr. Cary Stewart, P.E. and Mr. Craig Stampher, P.E., Associate Civil Engineers.

The BSI CONSULTANTS, INC. Project Team consisted primarily of:

Mr. Neal D. Brown	Project Engineer/Manager
Mr. Gary J. Hobson, P.E.	Principal-in-Charge
Mr. Jeffrey M. Cooper, P.E.	Quality Control

We are grateful for the opportunity to serve the City on this important project and appreciate the cooperation shown by all of the City's staff.

INTRODUCTION

The Citywide Drainage Study is a combination of two studies describing the hydrologic and hydraulic characteristics of the City of Santee and recommending necessary improvements throughout the City.

PHASE I

Phase I was concerned with the inventory of existing storm drain facilities in the city and with determining design discharges for the 100 year frequency storm. All facilities in the City were inventoried and mapped on Plate 1 with a reference number. All known and estimated data for each facility was listed in Appendix 2 with the same reference number. The City was then divided into drainage basins and the 100 year flows calculated using the San Diego County Hydrology Method. Plate 2 contains the mapping used in calculating the hydrology. The nodes and flow paths correspond to the hydrology calculations found in Appendix 3 and 4 of this report. The letter in the reference node corresponds to the drainage basin and is similar throughout all four plates. The number of the node however has no relation to Plates 1, 3 and 4. Nodes not shown on Plate 2 are up stream of the closest node shown on the map. The predicted runoff was routed to each facility and compared with the open flow capacity of each of these facilities as determined by Mannings Equation and listed in Appendix 2. From this comparison, capacity deficiencies were determined.

PHASE II

Phase II defined the criteria and then determined which facilities inventoried from Phase I would be considered master drainage facilities. Plate 3 shows the location and reference number of all Master Facilities. Plate 4 is similar to Plate 3 but only shows those facilities that cannot maintain the 100 year flow and were labeled deficient. Plates 1, 3 and 4 are only schematic and actual improvement plans should be used for facility information. During this phase there was also criteria defined and implemented determining the amount of pressure flow and street flow that would be allowed in a master drainage facility. Recommendations for improvement and cost estimates were provided for all master drainage facilities that did not meet this criteria.

The results of both Phase I and Phase II are compiled in list form in Appendix 2. This list contains the inventory of existing drainage facilities, existing capacities, design flows, designation of master facilities as well as deficient master facilities, and recommended improvements with corresponding cost estimates.

INVENTORY OF EXISTING FACILITIES

The base topography used for this Citywide Hydrology Study is the most recent topographic mapping available. The several sources of topographic mapping include San Diego County orthophoto topographic maps (5 foot contour interval and a scale of 1 inch equals 200 feet) and various grading plans. The most recent County topographic maps, dated 1972, do not cover the entire City limits, so in those areas the most recent topographic mapping available is dated July 1960. Wherever new development has significantly altered the landform, the appropriate grading plans were reviewed and incorporated into the hydrology study.

All readily available drainage information and studies on file with all responsible organizations within and adjacent to the City have been collected and reviewed as required for this study. Design plans were obtained from the County of San Diego, Caltrans and the City of Santee. Drainage reports were obtained from the Corps of Engineers, the County of San Diego, the City of Santee, and the Federal Emergency Management Agency. A detailed list of these reviewed reports is shown in Appendix 1. This list also indicates the hydrologic methods used for areas of local drainage. Also reviewed were a number of individual project reports prepared by BSI Consultants, Inc. for the City of Santee. These project reports are also identified in Appendix 1.

All existing visible drainage facilities within the City were identified in the field and inventoried. The inventoried drainage facilities are described in Appendix 2, and given a deficiency rating indicating erosion problems and maintenance needs.

An inventory of all natural channels within the City has been performed, noting size, general characteristics, and major obstructions such as bridges or other flood plain encroachments. The inventory of the natural channels is defined in Appendix 2. The capacity and velocity calculations were made assuming that all natural channels were properly maintained as flood control channels. Many of these channels have a decreased capacity due to natural vegetation and need for maintenance. These channels are identified in Appendix 2.

Based on the recorded data and field observations, the capacity and physical stability of each existing facility has been identified and appears in Appendix 2. Where the size or slope of the drainage facility is not available from City records nor able to be readily determined in the field, the symbol N/A (not available) is entered in Appendix 2. Where information was estimated in the field, brackets have been placed around the value used.

The capacity of open channels is based on normal depth calculations using the channel slope, unobstructed flow area, bank full depth, and existing friction values. A natural

channel with the capacity to convey the design storm will be deficient if it is subject to erosion from excessive velocities.

Destructive velocities are defined as greater than:

6 feet per second for earth lined channels

15 feet per second for riprap lined channels

35 feet per second for concrete lined channels

HYDROLOGIC ANALYSIS

The hydrologic method used for this study is the Rational Method as described in the San Diego County Flood Control District Hydrology Manual, (January 1985 Revision) to estimate the 100-year runoff. The numerous drainage project studies and designs reviewed for this Citywide Study are identified in Appendix 1 and were used to aid in the selection of the appropriate hydrologic model.

The most recent topographic mapping available was used to delineate sub-basins and determine flow paths. The representative topographic mapping is the orthophoto mapping dated 1972 or the individual grading plans approved since 1972. After an initial hydrology analysis was performed using the underlying land use and soil types, soil group D was selected for use in all areas within the City. Land use for the study is based on the Land Use Plan adopted by the City dated August 15, 1984 and all amendments up to November 12, 1987.

The Rational Method is defined by the equation

$$Q = CIA$$

Where:

Q is the peak rate of flow in cubic feet per second.

C is a runoff coefficient expressed as a percentage of rainfall which becomes surface runoff.

I is the average rainfall intensity in inches per hour for a storm duration equal to the time of concentration (T_c) of the contributing drainage area.

A is the drainage area in acres tributary to the design point.

The rainfall intensity is calculated by using Figures 1 and 2 which are applicable to all areas within San Diego County. The 6-hour 100-year rainfall amount is also identified on Plate 2 and should be used in place of Figure 1. The highest valued isopluvial should be used in each basin rounded up to the nearest tenth for all hydrology calculations.

Assuming that a uniform rainfall of constant intensity occurs over a watershed, the peak flowrate will occur when the entire watershed is contributing runoff. This peak Q usually occurs when runoff from the most distant point on the watershed reaches the point of concentration, with the corresponding travel time for this distance being the time of concentration.

The initial time of concentration calculation for natural watersheds may be obtained from Figures 3 and 4. The initial time of concentration calculation for urban watersheds is made using Figure 5. The time of concentration at any point within the drainage area is given by $T_c = T_i + T_f$ where:

T_i is the inlet time or the time required for the storm water to flow to the first inlet in the system. It is the sum of time in overland flow across lots and in the street gutter.

T_f is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question. Travel time, T_f, is computed by dividing the length of storm runoff by the computed mean flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm runoff.

Use Figure 6 to estimate time of travel for street gutter flow.

Some of the basic assumptions used in the RATIONAL METHOD are:

- (1) the return frequency of the estimated Q is approximately the return frequency of rainfall; that is, to estimate a 100-year return frequency peak flowrate (Q100), the "T" values are assumed to be of a 100-year return frequency;
- (2) rainfall intensities are assumed to be approximately uniform over the watershed;
- (3) the water shed runoff characteristics can be estimated sufficiently to be used in the runoff equation.

The Rational Method hydrologic calculations may be performed manually or, as in the case of the enclosed calculations, using software developed by Advanced Engineering Software (AES) which reflects the San Diego County Hydrology manual criteria. The AES software Version 3.4A or before may be used as issued with one significant exception.

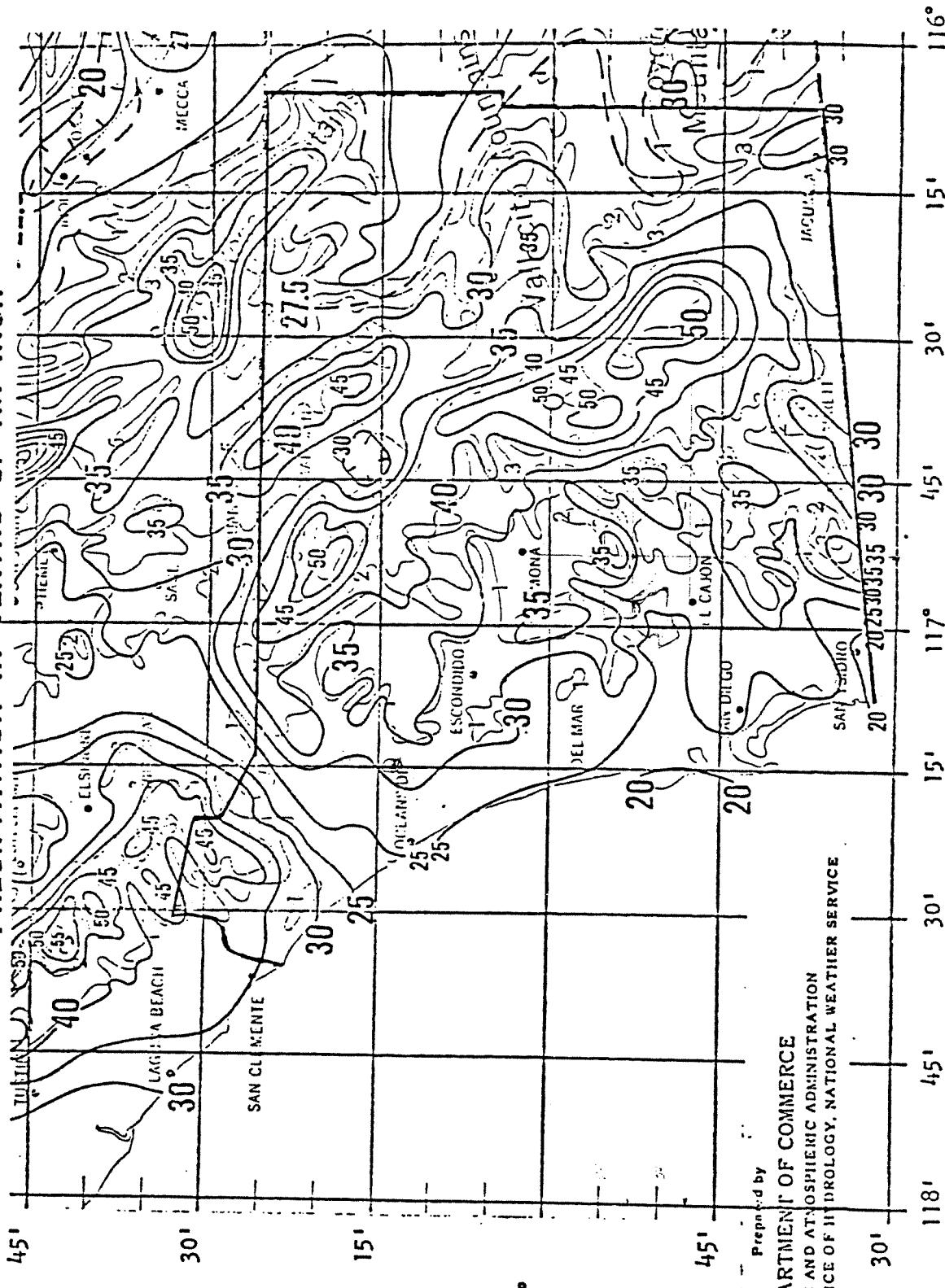
The software uses straight-line interpolation calculating the time of concentration for initial urban areas having distances greater than 500 feet or slopes greater than 2.5% or less than 0.5%. The calculation should be made by hand using the equation shown in Figure 5 and manually input into the watershed being modelled. Backup data used for this calculation can be found in Appendix 5. Future versions of the AES software will be modified to properly compute the initial time of concentration for urban watershed.

A summary and detailed hydrology printout for each of the 26 basins is included in Appendix 3 and 4 respectfully. Because the existing system in Q Basin splits at Mission Gorge Rd., the flow to be routed through each system is undeterminable and is therefore not available beyond the nodes at Mission Gorge Rd.

COUNTY OF SAN DIEGO
DEPARTMENT OF SANITATION &
FLOOD CONTROL

100-YEAR 6-HOUR PRECIPITATION

~20 - ISOPHYTALS OF 100-YEAR 6-HOUR PRECIPITATION IN TENTHS OF AN INCH

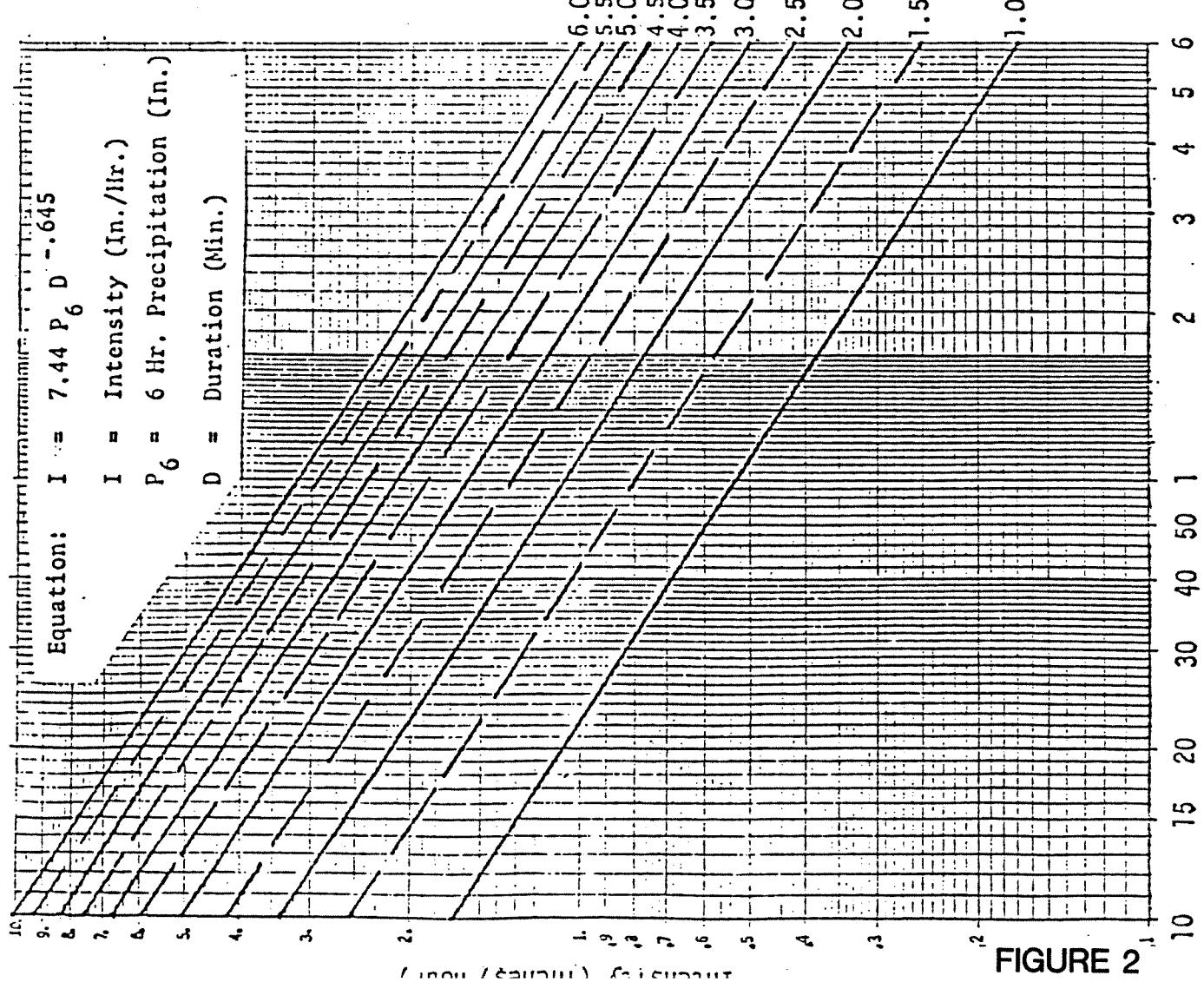


Prepared by

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
SPECIAL STUDIES BRANCH, OFFICE OF HYDROLOGY, NATIONAL WEATHER SERVICE

FIGURE 1

INTENSITY-DURATION DESIGN CHART



Directions for Application:

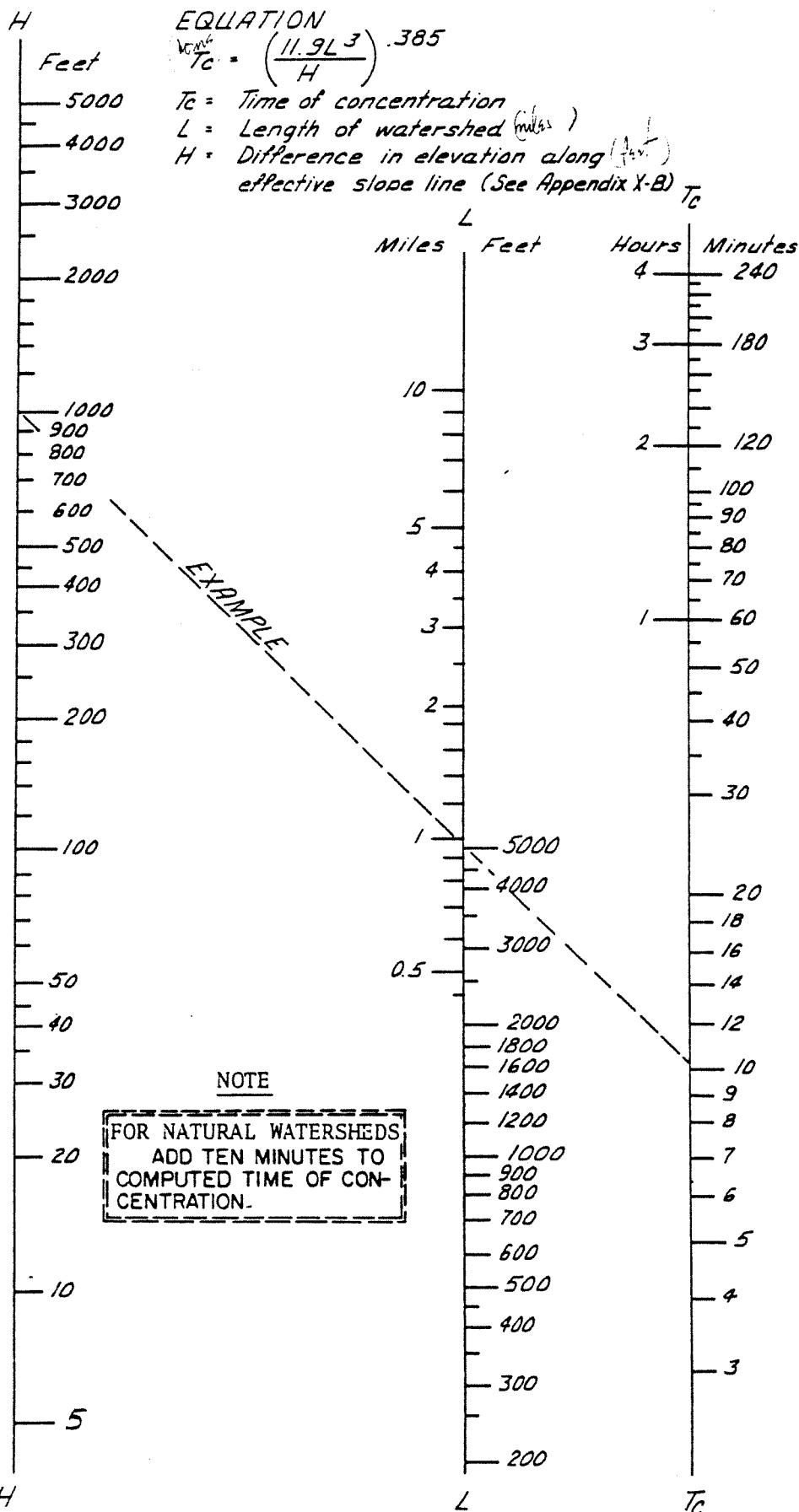
- 1) From precipitation maps determine 6 hr. and 24 hr. amounts for the selected frequency. These maps are printed in the County Hydrology Manual (10, 50 and 100 yr. maps included in the Design and Procedure Manual).
- 2) Adjust 6 hr. precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr. precipitation. (Not applicable to Desert)
- 3) Plot 6 hr. precipitation on the right side of the chart.
- 4) Draw a line through the point parallel to the plotted lines.
- 5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

- 0) Selected Frequency _____ yr.
- 1) $P_6 = \underline{\hspace{2cm}}$ in., $P_{24} = \underline{\hspace{2cm}}$, $*P_6 = \frac{\underline{\hspace{2cm}}}{\underline{\hspace{2cm}}} \text{ in.}$
- 2) Adjusted $*P_6 = \underline{\hspace{2cm}}$
- 3) $t_C = \underline{\hspace{2cm}}$ min.
- 4) $I = \underline{\hspace{2cm}}$ in/hr.

*Not Applicable to Desert Region

FIGURE 2



SAN DIEGO COUNTY
DEPARTMENT OF SPECIAL DISTRICT SERVICES

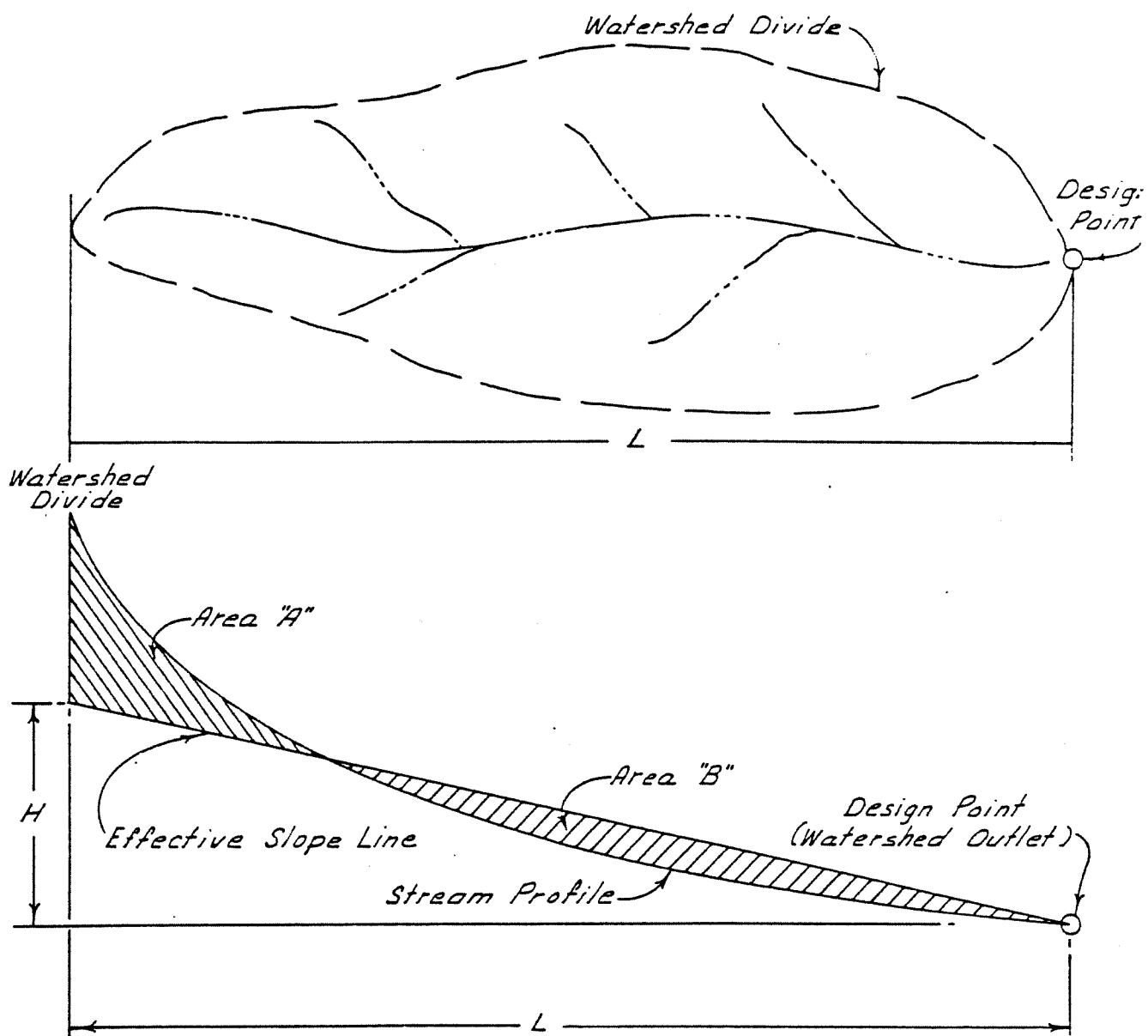
DESIGN MANUAL

APPROVED J. H. Hoffmaster

NOMOGRAPH FOR DETERMINATION
OF TIME OF CONCENTRATION (*Tc*)
FOR NATURAL WATERSHEDS

DATE 12/1/69

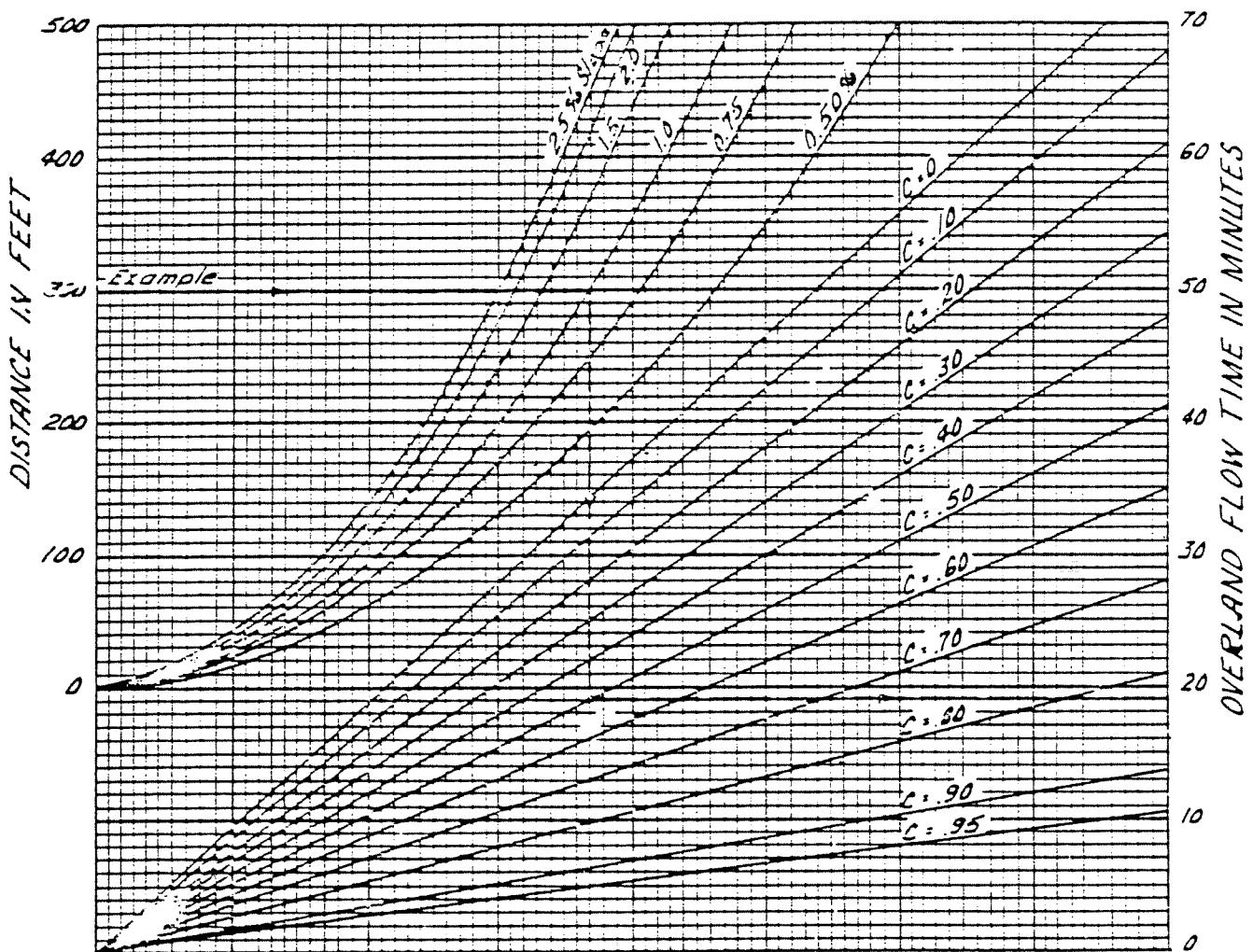
FIGURE 3



Area "A" = Area "B"

URBAN AREAS OVERLAND TIME OF FLOW CURVES

$$T = \frac{1.8(1.1-C)\sqrt{D}}{\sqrt[3]{S}}$$



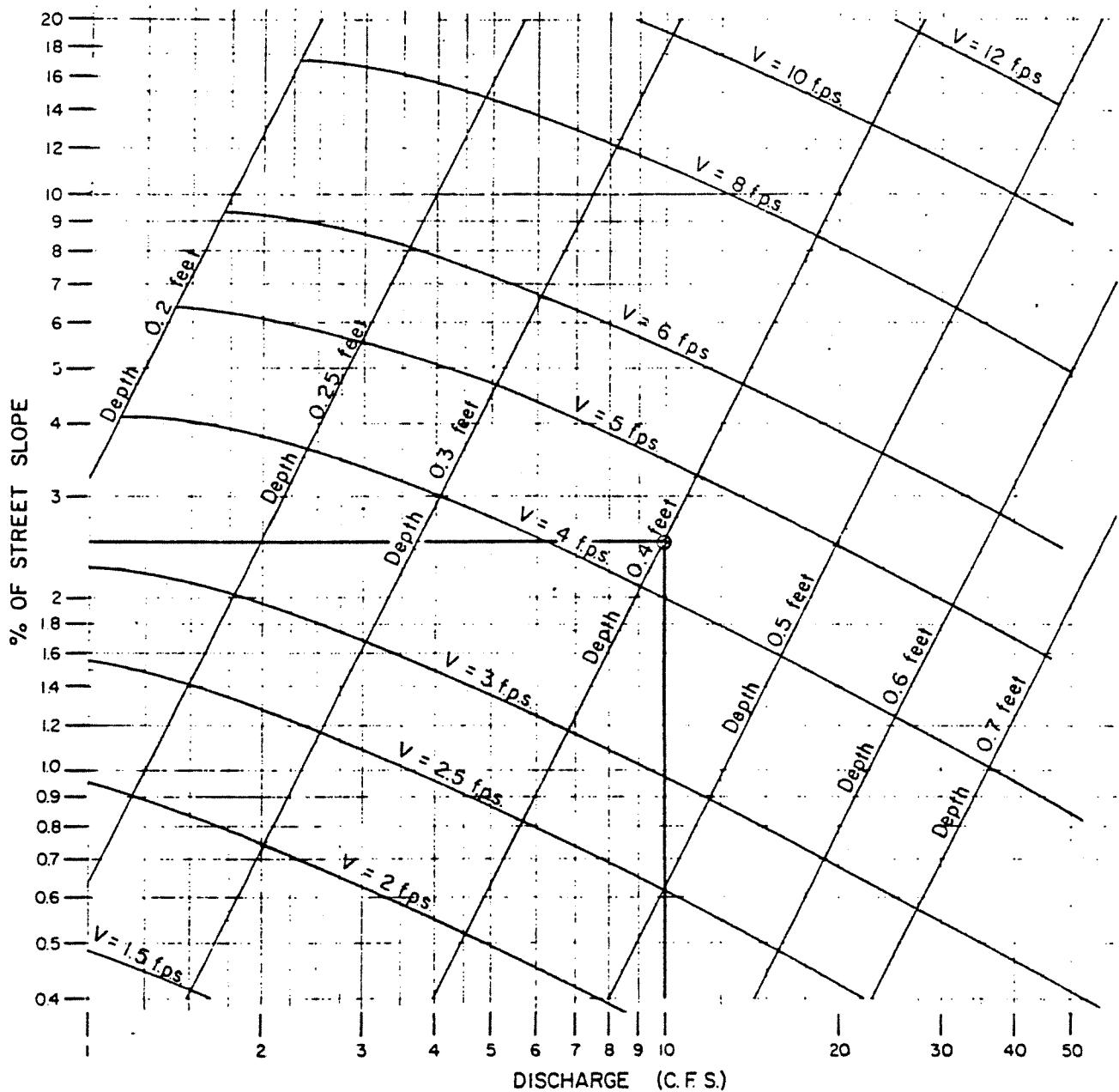
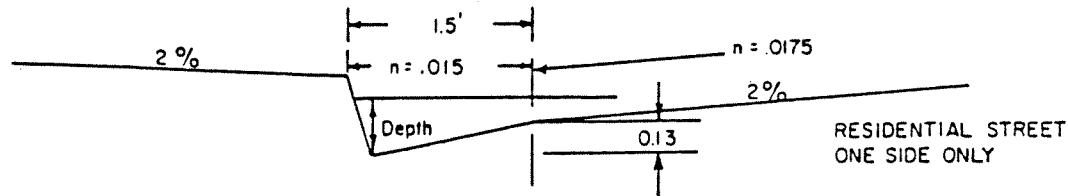
Example:

Given: Length of Flow = 300 ft.

Slope = 1.0 %

Coefficient of Runoff, C = .50

Read: Overland Flowtime = 19 Minutes



EXAMPLE:

Given: $Q = 10$ $S = 2.5\%$
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

DEFICIENCIES

During Phase I, the design flow from the 100 year frequency storm was often larger than the open flow capacity of a facility. All of these facilities were used as having a capacity deficiency. The listing in Appendix 2 has a column designating which facilities have a capacity deficiency, as well as other deficiencies. The other types of deficiencies investigated are explained below and are also indicated in Appendix 2.

C - CAPACITY If the predicted 100-year runoff exceeds the existing capacity of that facility, it has a capacity deficiency.

E - EROSION If an unlined channel has a 100-year flow velocity greater than 6 fps, it has an erosion deficiency.

M - MAINTENANCE If a facility no longer exists in its original as-built condition due to erosion, vegetative growth, sedimentation, or some other physical degradation, it has maintenance deficiency.

S - SERVICE LIFE This designation is meant to indicate that a pipe facility is made of corrugated metal and will have a shorter service life than reinforced concrete pipe.

V - VELOCITY A facility will be noted as velocity deficient if an unlined facility has a 100-year flow velocity of greater than 6 fps or a riprapped channel has a velocity of greater than 15 fps or if a concrete lined channel or pipe has a 100-year flow velocity of greater than 35 fps.

Of the five deficiencies addressed, the capacity deficiency was the most prevalent, occurring in all 26 drainage basins. The service life deficiency also occurs throughout the city, however it does not impose any threat to life or property. Maintenance deficiencies occurred almost exclusively in box culverts and open channels due mainly to sedimentation deposits and vegetation growth. These blockages greatly decrease the capacity of the facility in many cases. Erosion and velocity deficiencies are mainly associated with unlined channels and impose very little immediate threat.

Many of the capacity deficiencies throughout the city exist because of short stretches of mild slope within a system. Many of these stretches are considered minor deficiencies while others may need a parallel system until the slope steepens.

The existing drainage facilities on the north side of the San Diego River were generally adequate while those on the south side of the river were generally deficient. This is due primarily to the mild slopes on the south side of the river. There are three drainage basins located in the southeast portion of the city that possess significant deficiencies. Basins O, P and Q need parallel or replacement systems throughout almost the entire length of the basin. Q basin is clearly the worst problem in the city. This is due to the significant areas zoned to industrial use and to extremely mild slopes. Even though there

is presently many acres of undeveloped land, the hydrology study assumes ultimate development using a industrial development runoff coefficient of 0.95. That is to say that 95% of the 100 year frequently storm needs to be routed to the river.

Recommendations to improve existing conditions are listed in Appendix 2 as well as discussed in the Recommendations Section.

MASTER DRAINAGE FACILITIES

In order for the City of Santee to determine storm drain improvements that would qualify for developer reimbursement, it was necessary to provide a set of criteria defining a master drainage facility. This criteria was developed with the intent to provide protection to both public and private property from offsite runoff.

The City of Santee has defined a master drainage facility as any storm drain facility that meets any of the following criteria:

1. Any drainage system requiring the equivalent of a 36-inch diameter reinforced concrete pipe under ultimate development conditions and conveying at least 12.5 cubic feet per second of storm runoff from a Circulation Element public road, or a Non-Circulation Element public road.
2. Any drainage system that conveys at least 12.5 cubic feet per second of storm runoff from a Circulation Element road, City of Santee Park, or City-owned open space.
3. Any of the following:
 - a. The San Diego River
 - b. Forester Creek
 - c. Fanita Creek
 - d. Woodglen Vista Creek
 - e. Big Rock Creek
 - f. Sycamore Creek

The 12.5 cfs limitation was chosen because it will allow one lane open from flooding during the 100 year frequency storm on major roads having two lanes in each direction and having a one percent minimum slope. (See Figure 6.)

A deficient master drainage facility is any master drainage facility that has a full-flow capacity less than the 100 year runoff that has been allocated to that facility.

A deficient master drainage facility will be labeled as being minor if it meets all of the following criteria:

1. The 100 year flow can be maintained within the existing facility using no greater than 2 foot of pressure head.
2. No greater than 12.5 cfs of flow is allowed on the street.

Improvements were recommended for all deficient master drainage facilities that did not meet the criteria for minor deficiencies listed above. Supporting calculations in determining minor facilities can be found in Appendix 5.

RECOMMENDATIONS

Appendix 2 contains recommendations for all deficient master drainage facilities that did not meet the requirements for minor deficiencies. With very few exceptions, replacement or parallel facilities were sized to transport the 100 year frequency storm with non-pressure flow. In isolated situations minor pressure flow may be required to achieve the needed capacity because of existing upstream or downstream conditions.

Each non-minor, deficient master facility was looked at individually to determine the most suitable improvement needed to maintain non-pressure flow. Existing plans were reviewed as well as utility maps to ensure all recommended improvements were achievable. Also all recommended improvements use existing right of ways or existing locations of open channels. Increasing facility sizing was continued downstream with only a few exceptions in which a 6 inch decrease in downstream size was allowed. As a general rule of thumb, all corrugated metal pipe that was deficient was recommended to be replaced. Also all pipes with a diameter less than 30 inches was recommended to be replaced. Any facility over 30 inches in diameter was recommended to be paralleled.

Q BASIN

All recommended improvements with the exception of the Q basin was designed to follow the location of the existing system. In order to achieve the required capacity in the Q

basin, it was recommended that the existing pipe on Cottonwood Ave. be upsized and extended to join the existing system on Buena Vista Ave. A schematic of the Q Basin in Diagram 1 and 2 following this section show both the existing and proposed systems. Splitting the flow at this point in addition to executing the other recommend improvements listed in Appendix 2 should adequately carry the 100 year frequency storm to the San Diego River.

UNIT COSTS

The unit costs for recommended improvements listed in Appendix 2 are based on 1989 prices compiled from contractor bids in San Diego County and San Bernardino County during the past two years. Unit prices listed include costs for cleanout facilities as well as a 30% increase for engineering and construction contingencies. A listing of all unit prices used can be found on page 18 of this report. The ENR construction cost index equals 4655 based on the 20 city average with the 1913 base year. A listing of all recommended improvements can be found in Appendix 5 of this report. The total cost of recommended improvements was about 10.4 million dollars.

ESTIMATED UNIT COSTS FOR RECOMMENDED IMPROVEMENTS

FACILITY SIZE	ESTIMATED UNIT COST PER LINEAR FOOT
24" RCP	130
30" RCP	150
33" RCP	160
36" RCP	175
42" RCP	200
48" RCP	230
54" RCP	260
60" RCP	285
72" RCP	315
84" RCP	390
(2) 24" RCP	220
(2) 54" RCP	490
(2) 60" RCP	515
5' X 4' RCB	315
6' X 3' RCB	335
8' X 4' RCB	435
8' X 5' RCB	470
10'X 4' RCB	585
10'X 5' RCB	640
12'X 6' RCB	1085
(2) 7' X 4' RCB	975
b=8' h=6' s=1.5:1 n=0.03	85
b=10' h=5' s=1.5:1 n=0.03	150
b=10' h=6' s=1.5:1 n=0.03	165
b=12' h=5.5' s=1.5:1 n=0.03	155
b=20' h=6' s=1.5:1 n=0.03	220
b=8' h=5' s=1.5:1 n=0.015	230
b=12' h=6' s=1.5:1 n=0.015	380

BASIN Q EXISTING

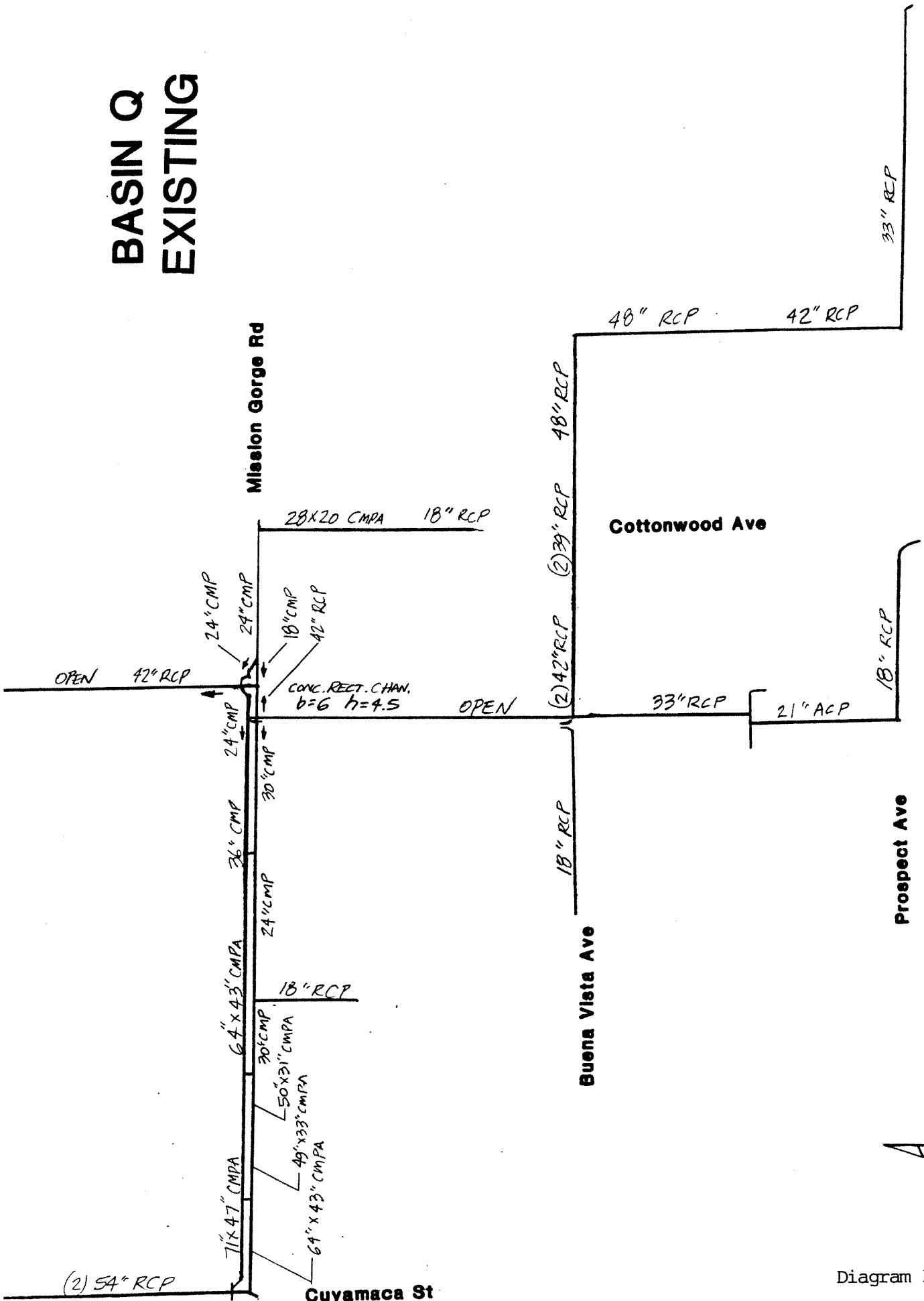


Diagram 1

BASIN Q PROPOSED

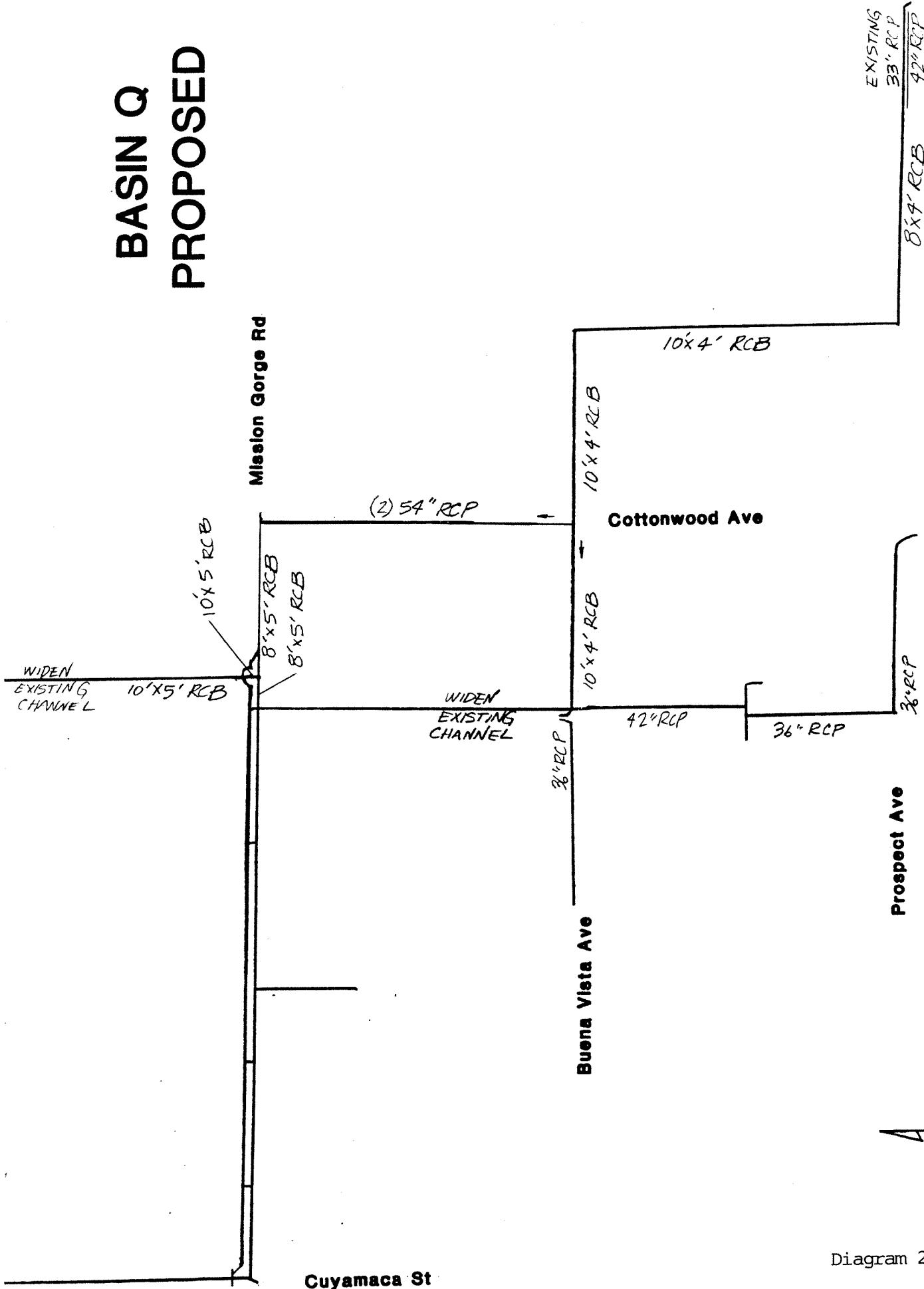


Diagram 2

* FACILITIES WITHOUT CHANGES PROVIDED NOT LISTED

N

APPENDIX I

REPORTS REVIEWED

REPORTS REVIEWED

LOCAL HYDROLOGY METHODOLOGY

- | | | |
|-----|--|---|
| 1. | Flood Plain Information - San Diego River, Corps of Engineers. | |
| 2. | Flood Insurance Study - Santee, Federal Emergency Management Agency. | |
| 3. | Fee Program Study Report, Graves Engineering, September 1981 | |
| 4. | Santee Drainage Fee Supplemental Report, Graves Engineering, December 1986 | |
| 5. | Santee Drainage Fee Revised, BSI Consultants, Inc., March, 1987 | |
| 6. | Storm Drain Inventory and Management System, Testing Engineers, September, 1984 | |
| 7. | General Plan for Flood Control and Storm Drain Improvements for Santee - Lakeside Area Zone II, San Diego County Flood Control District (Lawrence, Fogg, Smith and Associates), February, 1975 | Modified Rational 50-Year Runoff |
| 8. | Comprehensive Plan for Flood Control and Drainage Zone 2, San Diego County Flood Control District (George S. Nolte and Associates), January, 1976 | SCS Unit Hydrograph 50- and 100-Year Runoff |
| 9. | General Drainage Plan for Forester Creek, San Diego County flood Control district, (Wilsey & Ham), | Modified Rational |
| 10. | Northeast of Prospect and Magnolia BSI Consultants, September 1987 | Rational |

REPORTS REVIEWED

LOCAL HYDROLOGY
METHODOLOGY

- | | |
|---|----------|
| 11. Prospect and Cuyamaca
BSI Consultants, September, 1987 | Rational |
| 12. Cuyamaca and Mission Gorge
BSI Consultants, August, 1986 | Rational |
| 13. Woodside Avenue and Security Way
BSI Consultants, November, 1987 | Rational |

APPENDIX II

**SUMMARY OF EXISTING
CONDITONS AND
RECOMMENDED IMPROVEMENT**

CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST (/LF)	COST (\$)
								PIPE	PIPE		
* A5a	56 " CIP	0.0375	747	0.013	650	343					
* A5b	66 " CIP	0.02	931	0.013	475	371					
* A5c	72 " RCP	0.014	488	0.013	501	405	M				
A5d	24 " RCP	0.02	153	0.013	32	35	C				
A5e	24 " CMP	0.0844	108	0.024	36	35	S				
A5f	18 " CMP	0.0497	155	0.024	13	18	C,S				
A20a	24 " CMP	0.11	78	0.024	41	17	S				
A20b	24 " RCP	0.02	82	0.013	32	17					
* B5a	30 " CMP	0.0356	30	0.024	42	42	S				
* B5b	36 " CMP	0.0188	595	0.024	50	47	S				
* B5c	71 " x 47 " CMPA	0.005	457	0.024	81	74	S				
B5d1	18 " CMP	0.0456	174	0.024	12	5	S				
B5d2	18 " CMP	0.0483	132	0.024	13	5	S				
B5e	18 " CMP	0.0065	126	0.024	5	5	S				
B5f	18 " CMP	0.0232	301	0.024	9	5	S				
* B20a1	18 " RCP	0.0652	200	0.013	27	15					
* B20a2	18 " RCP	0.0556	236	0.013	25	20					
* B20b1	27 " RCP	0.0589	48	0.013	75	22					
* B20b2	27 " RCP	0.0312	136	0.013	55	25					
* B20b3	27 " RCP	0.01	28	0.013	31	30					
B30a	42 " CMP	0.03	284	0.024	94	57	S				
* B30b	36 " RCP	0.02	180	0.013	94	80					
* B30c	36 " RCP	0.05	120	0.013	149	80					
* C5a	27 " RCP	0.1079		0.013	102	62					
C5b	18 " RCP	0.018		0.013	14	5					
* +C5c	18 " CMP	0.025	[100]	0.024	9	24	C,S	24		130	13000
* C5d	18 " RCP	0.0638		0.013	27	24					
C10a	21 " x 13 " CMPA	0.01		0.024	5	15	C,S				
C15a1	27 " ACP	0.02	102	0.013	44	40					
C15a2	27 " CMP	0.062	37	0.024	42	55	C,S				
C15a3	27 " RCP	0.0672	201	0.013	80	55					
C15b	30 " RCP	0.062	37	0.013	102	70					
C15c	33 " RCP	0.032	470	0.013	95	70					
* C15d1	36 " RCP	0.032	44	0.013	119	85					
* C15d2	36 " RCP	0.0188	128	0.013	91	85					
C20a1	27 " ACP	0.031	103	0.013	55	44					
C20a2	27 " ACP	0.03	166	0.013	54	54					
C20a3	27 " ACP	0.056	210	0.013	73	65					
C20a4	27 " ACP	0.05	180	0.013	69	84	C				
C20b	30 " ACP	0.031	175	0.013	72	84	C				
C20c	18 " ACP	0.03	130	0.013	18	10					
C25a1	21 " ACP	0.025	123	0.013	25	36	C				
C25a2	21 " ACP	0.03	35	0.013	27	43	C				
C25a3	21 " ACP	0.04	106	0.013	32	43	C				
C25a4	21 " ACP	0.25	57	0.013	79	43					
C25b	24 " ACP	0.03	108	0.013	39	43	C				
C25c	27 " ACP	0.02	262	0.013	44	50	C				
C30a1	33 " RCP	0.07	93	0.013	140	68					
C30a2	33 " RCP	0.035	285	0.013	99	74					

* = MASTER DRAINAGE FACILITY + = DEFICIENT MASTER DRAINAGE FACILITY [] = ESTIMATED VALUE

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CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS PIPE	UNIT COST	COST
C30a3	33 " RCP	0.03	167	0.013	92	79				
C35a1	43 " x 27 " CMPA	0.26	6	0.024	155	37	S			
C35a2	21 " RCP	0.0263	39	0.013	26	44	C			
C35a3	21 " ACP	0.0322	343	0.013	28	44	C			
C35b1	36 " ACP	0.0115	48	0.013	72	56				
C35b2	36 " RCP	0.0053	144	0.013	49	56	C			
C35c	(2) 81" x 59" CMPA	0.0558	269	0.024	1150	539	S			
C35d	18 " RCP	0.1436	30	0.013	40	10				
* D5a	18 " RCP	0.04	[450]	0.013	21	96	C	36	175	78750
* D5b	36 " RCP	0.05		0.013	149	104				
* D5c	[b=4' h=3' s=2:1]	[0.05]	950	0.03	477	104	M,E,?			
* D5d	42 " CMP	0.046	236	0.024	117	114	S			
* D5e	(2) 4' x 2' RCB	0.03		0.013	242	135				
D5f	18 " CMP	0.01	48	0.024	6	10	C,S			
D5g	24 " CMP	0.01	94	0.024	12	10	S			
D20a	18 " CMP	0.024	41	0.024	9	30	C,S			
D20b	24 " RCP	0.065	97	0.013	58	30				
* D20c	(2) 29" x 18" CMPA	0.03		0.024	36	30	S			
D24a	18 " CMP	0.4		0.024	36	11	S			
D24b	22 " x 13 " CMPA	0.01		0.024	5	11	C,S			
D25a	21 " RCP	0.072		0.013	43	28				
D25b	30 " RCP	0.028		0.013	69	28				
D25c	30 " RCP	0.0232		0.013	62	38				
D25d	30 " RCP	0.064	340	0.013	104	38				
* D25e	42 " RCP	0.041	176	0.013	204	43				
* D25f	36 " CMP	0.042		0.024	74	43	S			
* D25g	[b=20' h=10' s=2:1]	0.12	420	0.03	23115	49	E,V,?			
* D25h	36 " RCP	0.24	64	0.013	327	56	?			
D25i	21 " RCP	0.02	104	0.013	22	5				
D25j	18 " CMP	0.08	89	0.024	16	7	S			
D35a	24 " RCP	0.05	100	0.013	51	53	C			
D35b	30 " CMP	0.036	42	0.024	42	53	C,S			
D35c	36 " RCP	0.016		0.013	84	62				
D40a	b=4' h=2.5' s=1.5:1	0.03		0.015	433	140				
D40b1	42 " CMP	0.032	136	0.024	97	146	C,S			
D40b2	42 " RCP	0.042	126	0.013	206	146				
D40c1	42 " CMP	0.036	94	0.024	103	146	C,S			
D40c2	42 " RCP	0.016	142	0.013	127	146	C			
D40c3	42 " CMP	0.036	94	0.024	103	154	C,S			
D40d	42 " RCP	0.031	112	0.013	177	164				
D45a1	18 " RCP	0.01	42	0.013	11	10				
D45a2	18 " RCP	0.018	115	0.013	14	10				
D45a3	18 " RCP	0.032	44	0.013	19	10				
D45a4	18 " RCP	0.036	106	0.013	20	10				
D50a1	18 " CMP	0.438	93	0.024	38	21	S			
D50a2	18 " CMP	0.0833	693	0.024	16	21	C,S			
D50b	30 " RCP	0.023	210	0.013	62	42				
D55a	24 " ACP	0.0456		0.013	48	41				
D55b	27 " ACP	0.015		0.013	38	41	C			

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CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS	UNIT	COST
								REPLACEMENT PIPE	PIPE	
D55c	30 " RCP	0.015		0.013	50	45				
* D55d	36 " RCP	0.015		0.013	82	65				
D60a	42 " RCP	0.0262		0.013	163	177	C,M			
D60b	18 " RCP	0.0267		0.013	17	10				
D60c	42 " RCP	0.075		0.013	275	187				
D60d	18 " CMP	0.035		0.024	11	10	S			
* D60e	48 " RCP	0.051		0.013	324	214				
D65a	(5) 42" X 54" CMPA	N/A		0.024			S,?			
D65b	OPEN	N/A		0.03			?			
* D65c	[b=10 h=3 s=1.5:1]	[0.0096]	[550]	0.015	690	279	?			
* D65d1	(2) 36 " CMP	[0.02]	94	0.024	102	100	S,?			
* D65d2	(3) 30 " CMP	[0.02]	94	0.024	94	90	S,?			
* D65e	36 " X 48 " CMPA	[0.02]	94	0.024	93	90	S,?			
* D65f	[b=10' h=3' s=2:1]	[0.02]	[500]	0.03	542	300	?			
* +D65g	[b=5' h=3' s=3:1]	[0.0096]	[6000]	0.03	296	610	C,?	b=10' h=5' s=1.5:1	150	900000
* +D65h	(3) 58" X 36" CMPA	[0.0096]	(50)	0.024	194	297	C,S,?	MINOR		
* +E5a1	24 " RCP	0.016	42	0.013	29	30	C	MINOR		
* E5a2	30 " ACP	0.022	185	0.013	61	30				
* E5b	30 " RCP	0.026	575	0.013	66	40				
E5c	18 " RCP	0.0154	51	0.013	13	16	C			
* +E5d	30 " RCP	0.02	569	0.013	58	60	C	MINOR		
* E5e	30 " RCP	0.03	504	0.013	71	67				
E5f	18 " RCP	N/A		0.013		7	?			
* +E5g	(2) 72 " CMP	0.002	[730]	0.024	205	610	C,S	12X6 RCB	1085	792050
E20a	21 " ACP	0.0222	319	0.013	24	15				
E20b	24 " RCP	0.05		0.013	51	42				
E20c	18 " ACP	0.02	43	0.013	15	12				
E30a1	18 " CMP	0.01	50	0.024	6	7	C,S			
E30a2	b=1' h=1' s=1.5:1	0.1076	206	0.015	54	7				
E30b	18 " CMP	0.04	252	0.024	11	7	S			
* +E30c1	36 " CMP	0.02	86	0.024	51	77	C,S	36	175	15050
* +E30c2	36 " CMP	0.016	18	0.024	46	84	C,S	36	175	3150
* E30d	42 " RCP	0.02		0.013	142	118				
* +E30e	48 " RCP	0.0055	[600]	0.013	106	124	C	MINOR		
E30f	18 " RCP	0.05		0.013	23	22				
E30g	18 " CMP	0.048	37	0.024	12	12	S			
E30h	24 " CMP	0.1	95	0.024	39	12	S			
E30i	18 " CMP	0.08	100	0.024	16	6	S			
F5a	18 " RCP	0.0054		0.013	8	5				
F5b	18 " RCP	0.0064	135	0.013	8	5				
* F5c	18 " RCP	0.01	41	0.013	11	21				
* F5d	42 " CMP	0.01		0.024	54	37	S			
* F5e	36 " RCP	0.0322	99	0.013	120	47				
* F5f	36 " RCP	0.005	84	0.013	47	47				
F10a	18 " RCP	0.03		0.013	18	15				
F10b	24 " RCP	0.04		0.013	45	24				
* F10c	42 " RCP	0.015		0.013	123	35				
F15a	24 " CMP	0.02	38	0.024	17	19	C,S			
F15b	24 " CMP	0.062	100	0.024	31	19	S			

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS PIPE	UNIT COST	COST
								PARALLEL PIPE		
F15c	24 " CMP	0.004	90	0.024	8	33	C,S			
F15d	OPEN	[0.024]	1050	0.03	49	?				
* +F15e	36 " CMP	0.015	102	0.024	44	49	C,S			MINOR
* F15f	48 " CMP	0.04	123	0.024	156	49	S			
* F15g	48 " CMP	0.01	303	0.024	78	49	S			
* F15h	48 " RCP	[0.01]		0.013	144	49	?			
F15i	48 " CMP	0.008	186	0.024	70	12	S			
F25a	18 " CMP	0.0104	150	0.024	6	12	C,S			
F25b	30 " CMP	0.007	316	0.024	19	18	S			
G10a1	60 " CIP	0.0236	199	0.013	400	359	M			
G10a2	60 " CIP	0.03	853	0.013	451	379				
G10a3	60 " RCP	0.025		0.013	412	379				
G10b	21 " ACP	0.108	180	0.013	52	10				
G10c	18 " ACP	0.047	102	0.013	23	10				
G10d	30 " RCP	0.014	55	0.013	49	10				
G10e1	18 " ACP	0.5	58	0.013	74	9				
G10e2	18 " ACP	0.0398	95	0.013	21	9				
G10e3	18 " ACP	0.013	41	0.013	12	9				
G10e4	21 " ACP	0.014	130	0.013	19	9				
G10f1	18 " RCP	0.36	32	0.013	63	12				
G10f2	18 " RCP	0.32	80	0.013	59	12				
G10f3	21 " RCP	0.03	96	0.013	27	12				
G10f4	24 " RCP	0.054		0.013	53	12				
G10f5	24 " RCP	0.0292		0.013	39	12				
* G10g1 b=3' h=3.5' s=1.5:1		0.0348	854	0.015	804	426				
* G10g2	66 " RCP	0.02	77	0.013	475	426				
G10h1	21 " ACP	0.01	40	0.013	16	12				
G10h2	21 " ACP	0.034	140	0.013	29	26				
G11a1	18 " CMP	0.02	116	0.024	8	23	C,S			
G11a2	18 " CMP	0.666	22	0.024	46	23	S			
* G15a b=8' h=3' s=1.5:1		0.034	1280	0.015	1085	561	M			
G20a	18 " RCP	0.008		0.013	9	60	C			
* G20b	36 " RCP	0.0384	388	0.013	131	90				
* +G20c1	42 " CMP	0.014	116	0.024	64	90	C,S			MINOR
* G20c2	42 " CMP	0.04	337	0.024	109	100	S			
* G20d1	36 " RCP	0.04	340	0.013	133	90				
* G20d2	36 " RCP	0.0184	66	0.013	90	90				
* G20e	60 " RCP	0.005	145	0.013	184	110				
G21a	18 " CMP	0.667	3	0.024	46	10	S			
G21b	18 " RCP	0.04	262	0.013	21	10				
G21c	18 " RCP	0.01	8	0.013	11	10				
G21d	18 " RCP	0.02	20	0.013	15	10				
* +G25a	(3) 48 " CMP	0.017	132	0.024	304	561	C,M,S	8X4 RCB	435	57420
G25b	18 " RCP	0.028	294	0.013	18	15				
G25c	24 " RCP	0.072	162	0.013	61	20				
G25d	18 " CMP	0.08	122	0.024	16	6	S			
* G25e [b=20'h=3's=1:1]		0.017		0.03	803	625	E,M,V			
* G30a	(2) 60 " RCP	0.04	94	0.013	1041	625				
* G30b	(2) 60 " RCP	0.05	194	0.013	1164	635				

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST	COST
								REPLACEMENT PIPE	PARALLEL PIPE		
*	G30c	(2) 8'x 6' RCB	0.006	1136	0.013	1218	711				
	G30d	18 " ACP	0.005	171	0.013	7					
	G30e	10 " ACP	0.0733	15	0.013	6					
	G30f	10 " ACP	0.0465	20	0.013	5					
	G30g	12 " ACP	0.03	20	0.013	6					
	G31a	18 " ACP	0.005	304	0.013	7					
	G31b	24 " ACP	0.01	60	0.013	23					
	G31c	30 " ACP	0.005	801	0.013	29					
	G31d	36 " ACP	0.005	339	0.013	47					
	G31e	18 " ACP	0.01	29	0.013	11					
	G31f	18 " ACP	0.005	30	0.013	7					
	G31g	18 " ACP	0.005	220	0.013	7					
	G31h	12 " ACP	0.01	30	0.013	4					
	G31i	12 " ACP	0.015	95	0.013	4					
	G31j	12 " ACP	0.0148	170	0.013	4					
	G31k	12 " ACP	0.0202	110	0.013	5					
	G31l	12 " ACP	0.0623	60	0.013	9					
	G31m	12 " ACP	0.146	15	0.013	14					
	G32a	18 " ACP	0.005	99	0.013	7					
	G32b	18 " ACP	0.006	189	0.013	8					
	G33a	12 " ACP	0.01	29	0.013	4					
	G33b	18 " ACP	0.0094	105	0.013	10					
	G33c	18 " ACP	0.005	332	0.013	7					
	G34a	12 " ACP	0.0145	154	0.013	4					
	G34b	24 " ACP	0.005	385	0.013	16					
	G34c	42 " ACP	0.0062	122	0.013	79					
	G34d	12 " ACP	0.229	22	0.013	17					
	H5a1	18 " RCP	0.078	176	0.013	29	50	C			
	H5a2	18 " RCP	0.012	116	0.013	12	50	C			
*	+H5a3	30 " CMP	0.02	37	0.024	31	67	C,S	36	175	6451
*	+H5a4	30 " CMP	0.04	44	0.024	44	67	C,S	36	175	7700
*	+H5a5	30 " CMP	0.06	26	0.024	54	67	C,S	36	175	4550
*	H5a6	[b=32' h=5' s=2:1]	[0.09]	620	0.03	7683	115	E,M,?			
	H5b1	18 " CMP	0.1184	98	0.024	20	10	S			
	H5b2	18 " CMP	0.125	144	0.024	20	10	S			
	H5b3	18 " CMP	0.13	116	0.024	21	10	S			
*	H5c1	36 " RCP	0.06	154	0.013	163	135				
*	+H5c2	42 " RCP	0.018	160	0.013	135	155	C			
*	+H5d1	42 " RCP	0.005	110	0.013	71	155	C	5X4 RCB	315	34650
*	+H5d2	58 " X 36 " CMPA	0.005	[50]	0.024	47	173	C,S	5X4 RCB	315	15750
*	+H5d3	65 " X 40 " CMPA	0.006	85	0.024	68	173	C,S	5X4 RCB	315	26744
*	H5e	6'x 5' RCB	0.003	150	0.013	231	218				
	H5f	12 " ACP	0.01	122	0.013	4					
	H5g	12 " ACP	0.01	73	0.013	4					
	H5h	18 " ACP	0.005	403	0.013	7					
	H5i	12 " ACP	0.01	29	0.013	4					
	H5j	18 " ACP	0.0055	104	0.013	8					
	H5k	12 " ACP	0.005	23	0.013	3					
	H5l	12 " ACP	0.01	20	0.013	4					

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST
								REPLACEMENT PIPE	PARALLEL PIPE	
H5m	18 " ACP	0.005	163	0.013	7					
H5n	18 " ACP	0.005	214	0.013	7					
H5o	12 " ACP	0.0179	136	0.013	5					
H5p	18 " ACP	0.01	46	0.013	11					
H5q	18 " ACP	0.01	67	0.013	11					
H6a	18 " ACP	0.005	419	0.013	7					
H6b	24 " ACP	0.005	431	0.013	16					
H6c	12 " ACP	0.01	108	0.013	4					
H6d	12 " ACP	0.01	92	0.013	4					
H6e	12 " ACP	0.2141	27	0.013	16					
I10a	24 " CMP	0.01		0.024	12			S		
* I10b	36 " RCP	0.004	765	0.013	42	40				
* I10c	42 " RCP	0.004	385	0.013	64	59				
* I10d	48 " RCP	0.004	371	0.013	91	64				
I10e	18 " ACP	0.0084	115	0.013	10					
I10f	18 " ACP	0.01	35	0.013	11					
I10g	18 " RCP	0.01	33	0.013	11					
I10h	24 " ACP	0.1416	62	0.013	85					
I10j	12 " ACP	0.0107	30	0.013	4					
I10k	12 " ACP	0.014	42	0.013	4					
I10l	18 " ACP	0.1514	20	0.013	41					
I11a	18 " ACP	0.005	313	0.013	7					
I11b	24 " ACP	0.011	30	0.013	24					
I11c	18 " ACP	0.005	104	0.013	7					
I11d	12 " ACP	0.0069	29	0.013	3					
I11e	12 " ACP	0.005	139	0.013	3					
I15a1	18 " RCP	0.0329	104	0.013	19	21		C		
I15a2	18 " RCP	0.326	39	0.013	60	21				
I15a3	18 " RCP	0.03	302	0.013	18	21		C		
I20a	24 " RCP	0.02	147	0.013	32	30		V		
I20b	24 " RCP	0.419	23	0.013	146	30		C		
I20c1	24 " RCP	0.03	87	0.013	39	45				
I20c2	24 " RCP	0.34	30	0.013	132	45				
I20d	24 " RCP	0.03	323	0.013	39	50		C		
I20e	24 " RCP	0.035	152	0.013	42	58		C		
I25a	36 " RCP	0.025		0.013	105	65				
I25b	36 " RCP	0.02		0.013	94	71				
* I25c1	36 " RCP	0.0166		0.013	86	77				
I25c2	36 " RCP	0.014		0.013	79	77				
* I25d	48 " RCP	0.0285		0.013	242	83				
I25e	21 " RCP	0.025		0.013	25	8				
* I30a	54 " CMP	0.0197		0.024	149	91		S		
* I30b	[b=2' h=2.7' s=1:1]	[0.013]	1500	0.15	170	100	E,?			
J5a	36 " RCP	0.044	896	0.013	140	119				
J5b	b=1' h=2.5' s=1.5:1	0.04	160	0.015	264	36				
J10a1	18 " ACP	0.07	348	0.013	28	9				
J10a2	18 " ACP	0.055	210	0.013	25	9				
J10a3	18 " ACP	0.036	101	0.013	20	9				
* J15a	42 " RCP	0.034	1220	0.013	185	184				

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* +J20a	54 " RCP	0.0071	345	0.013	166	235	C		42	200
J25a	18 " RCP	0.045	327	0.013	22	30	C			
J25b1	18 " RCP	0.07	271	0.013	28	45	C			
J25b2	18 " RCP	0.035	279	0.013	20	40	C			
J25c1	OPEN					90				
J25c2	OPEN					111				
* +J25d	54 " RCP	0.0092	117	0.013	189	312	C	MINOR		
* +J25e	54 " RCP	0.0161	[900]	0.013	249	312	C		36	175
* J25f	24 " RCP	0.02		0.013	32	30				
* J25g	b=14' h=6' s=1.5:1	0.0147		0.015	4093	1720				
J25h	(2) 50" x 31" CMPA	0.0063	95	0.024	70	90	C,S			
* +J30a	(2) 12.5' x 4.5' RCB	0.001	76	0.013	569	1720	C	MINOR		
* J30b	36 " RCP	0.005	246	0.013	47	15				
J30c	(2) 36" X 22" CMPA	0.0056	90	0.024	28	10	S			
* +J30d	[b=20' h=2.5' s=5:1]	0.007	[2000]	0.03	496	1800	C,E,M b=20 h=6 s=1.5 n=.03		220	440000
K5a	18 " ACP	0.01		0.013	11	10				
K5b	54 " CIPP	0.0637		0.013	496	208				
K5c	54 " RCP	0.01		0.013	197	208	C			
K5d	54 " RCP	0.01		0.013	197	208	C			
K5e	42 " RCP	0.09		0.013	302	75				
K5f	83" X 57" CMPA	0.0265		0.024	319	440	C,S			
K5g	83" X 57" CMPA	0.007		0.024	163	515	C,S			
* K5h	[b=4 h=4.5 s=1.5:1]	0.0254		0.015	1059	750	M,?			
* +K5i	84 " CMP	0.015	67	0.024	424	780	C,S	84		390
K10a	27 " RCP	0.0313	250	0.013	55	55				
K10b	27 " RCP	0.06		0.013	76	60				
K10c	27 " RCP	0.06		0.013	76	65				
K10d1	30 " CMP	0.02	282	0.024	31	70	C,S			
K10d2	30 " CMP	0.05	149	0.024	50	70	C,S			
* K10e1	b=4' h=6' s=1.5:1	0.005	60	0.015	1147	780				
* K10e2	b=4' h=4.5' s=1.5:1	0.018	480	0.015	1150	780				
* K10f1	28" x 20" CMPA	0.045	40	0.024	17	15	S			
* +K10f2	28" x 20" CMPA	0.008	138	0.024	9	15	C,S	MINOR		
* K10g1	b=4' h=4.5' s=1.5:1	0.025	620	0.015	1355	800				
* K10g2	b=4' h=4.5' s=1.5:1	0.0464	126	0.015	1846	800				
K10h1	18 " CMP	0.01	91	0.024	6	5	S			
K10h2	18 " CMP	0.48	49	0.024	39	5	S			
K10h3	18 " CMP	0.02	44	0.024	8	5	S			
K10h4	18 " CMP	0.48	22	0.024	39	5	S			
K15a	18 " ACP	0.018	155	0.013	14	15	C			
K15b1	30 " RCP	0.4	28	0.013	259	62	V			
K15b2	30 " RCP	0.04	261	0.013	82	62				
K15b3	33 " RCP	0.046	740	0.013	113	77				
* K15c	39 " RCP	0.019	332	0.013	114	77				
K15d1	18 " RCP	0.04		0.013	21	40	C			
K15d2	24 " RCP	0.004		0.013	14	40	C			
K15e1	24 " RCP	0.06	395	0.013	55	20				
* K15e2	30 " RCP	0.019	390	0.013	57	20				
K15f	18 " RCP	0.066	512	0.013	27	20				

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CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST	COST
								REPLACEMENT PIPE	PARALLEL PIPE		
K15g	24 " RCP	N/A	395	0.013		20	?				
* +K15h	36 " RCP	0.005	[1100]	0.013	47	60	C			24	130
* K15i [b=15' h=5' s=2:1]		0.02	1000	0.03	1959	1047	M,?				
* K15j1 b=8' h=6' s=1.5:1		0.0322		0.015	4143	1047	M				
* K15j2 [b=8 h=4.5 s=1.5:1]		0.0322		0.015	2310	1047	?				
K20a	PCC DITCH	N/A				30	?				
K20b	18 " ACP	0.2057	55	0.013	48	30					
K20c	21 " ACP	0.033	140	0.013	29	40	C				
K20d	24 " ACP	0.0286	289	0.013	38	40	C				
K20e	24 " ACP	0.0286	359	0.013	38	40	C				
* +K20f	24 " ACP	0.0343	327	0.013	42	45	C			MINOR	
* K20g	36 " RCP	0.023	486	0.013	101	45					
* K20h b=8' h=6' s=1.5:1		0.02	1145	0.015	3258	1185	M				
K21a	18 " ACP	0.0349	166	0.013	20	10					
K21b b=1' h=1.5' s=1.5:1		0.02		0.015	57	10					
K21c	18 " ACP	0.025	61	0.013	17	10					
K22a	b=2' h=3' s=1:1	0.06	715	0.015	462	80					
K22b	30 " RCP	0.015	500	0.013	50	90	C				
K22c	36 " RCP	0.01	158	0.013	67	100	C				
K25a	24 " RCP	0.016		0.013	29	35	C				
K25b	30 " RCP	0.016	138	0.013	52	35					
* K25c1 b=8' h=6' s=1.5:1		0.02		0.015	3258	1250	M				
* K25c2 20 ' X 6 ' RCB		0.02	54	0.013	3388	1263					
K30a	24 " RCP	0.008	269	0.013	20	30	C				
* K30b b=8' h=6' s=1.5:1		0.01	1160	0.015	2304	1263	M				
K35a	21 " ACP	0.017	163	0.013	21	19					
K35b1	27 " ACP	0.014	48	0.013	37	36					
K35b2	33 " ACP	0.008	128	0.013	47	36					
* K35c b=8' h=6' s=1.5:1		0.02		0.015	3258	1318	M				
L5a	18 " RCP	0.026	57	0.013	17	50	C				
L5b	21 " CMP	0.024	300	0.024	13	50	C,S				
* +L5c	27 " RCP	0.014	60	0.013	37	92	C		42		200
L10a	18 " RCP	0.01		0.013	11	10					
L10b 3' PCC DITCH		0.01		0.015	17	10	M				
L10c	24 " ACP	0.0126		0.013	25	28	C				
* +L10d	30 " ACP	0.012	200	0.013	45	47	C		MINOR		
L10e 5' PCC V-DITCH		0.02	339	0.015	81	5	V				
* L10f1	30 " RCP	0.22	16	0.013	192	47					
* L10f2	30 " RCP	0.015		0.013	50	47					
* +L10f3	30 " RCP	0.01	16	0.013	41	47	C		MINOR		
* L10g	30 " ACP	0.014		0.013	49	47					
* +L10h	36 " RCP	0.024	800	0.013	103	137	C		42		200
L10i	18 " ACP	0.02	161	0.013	15	40	C				
* +L10j	42 " RCP	0.01	500	0.013	101	228	C			48	230
* +L15a1 (2) 36" X 22" CMPA		0.01	50	0.024	36	168	C,S	6X3 RCB		335	16750
* +L15a2	18 " CMP	0.01	50	0.024	6	28	C,S	SEE L15a1			
L15b	24 " ACP	0.005	215	0.013	16	6					
* +L15c	42 " RCP	0.0142	502	0.013	120	215	C			42	200
L15d	30 " RCP	0.005		0.013	29	20					

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS	UNIT PIPE	COST
								REPLACEMENT PIPE	PIPE	
* +L15e	48 " RCP	0.0118	350	0.013	156	241	C		42	200
* +L15f	64 " X 53 " CMPA	0.0163	131	0.024	146	247	C,S	54		260
* +L15g	(2) 49" X 33" CMPA	0.009	121	0.024	84	247	C,S	60		285
* L20a	36 " RCP	0.0104		0.013	68	32				
* +L20b1	54 " CIP	0.007	300	0.013	164	265	C		48	230
* +L20b2	54 " RCP	0.003	350	0.013	108	265	C		48	230
* +L20b3	54 " CIP	0.007	243	0.013	164	265	C		48	230
L20c	30 " RCP	0.003	118	0.013	22	10				
L30a1	18 " RCP	0.0252	175	0.013	17	22	C			
L30a2	18 " RCP	0.05	360	0.013	23	22				
* L30b	30 " RCP	0.04	278	0.013	82	30				
L30c1	18 " RCP	0.628	36	0.013	83	12				
L30c2	18 " RCP	0.01	88	0.013	11	12	C			
L30c3	30 " RCP	0.0549	37	0.013	96	12				
L30c4	30 " RCP	0.055	251	0.013	96	22				
L30c5	18 " RCP	0.01	30	0.013	11	10				
* L30d	36 " CMP	0.18		0.024	153	76	S			
* +L30f	42 " RCP	0.004	989	0.013	64	76	C			
L30g	18 " RCP	0.004		0.013	7	10	C			
* +L30h	42 " CIP	0.004	1005	0.013	64	102	C			36 175 175875
L35a1	24 " X 38 " RCPA	0.0026	189	0.013	21	10				
L35a2	29 " X 45 " RCPA	0.0026	327	0.013	32	10				
L35b	18 " RCP	0.005	205	0.013	7	7				
L35c	18 " RCP	0.003	166	0.013	6	6				
L35d	14 " X 23 " RCPA	0.005	203	0.013	6	10	C			
L35e1	30 " RCP	0.0026	555	0.013	21	20				
* L35e2	36 " RCP	0.0026	110	0.013	34	25				
* L35f	(2) 66 " CIP	0.0035	823	0.013	397	322				
L35g	18 " RCP	0.01	105	0.013	11	7				
L35h	18 " RCP	0.01	165	0.013	11	7				
* L35i	4.5 ' X 7 ' RCB	0.0025	86	0.013	222	30				
L35j1	18 " RCP	0.016	110	0.013	13	7				
L35j2	18 " RCP	0.0125	86	0.013	12	7				
L35k	18 " RCP	0.0131	228	0.013	12	7				
* L35l	(2) 5' X 6' RCB	0.005	48	0.013	596	322				
* L35m	[b=125' h=6' s=2:1]	0.0053		0.03	9139	322	?			
M10a	18 " RCP	0.0377		0.013	20	26	C			
* +M10b	24 " RCP	0.0188	[150]	0.013	31	33	C			
M11a	24 " CMP	0.0254	106	0.024	20	10	S			
M11b	18 " CMP	0.163	12	0.024	23	5	S			
M11c	18 " CMP	0.02	36	0.024	8	5	S			
M11d	24 " CMP	0.044	112	0.024	26	5	S			
M15a	18 " RCP	0.0695	630	0.013	28	30	C			
M15b	18 " RCP	0.01	60	0.013	11	5				
* +M15c	24 " RCP	0.005	254	0.013	16	21	C			
* +M15d	b=0 h=1.4 s=1:1	0.005	[550]	0.015	9	51	C	36		175 96250
* M15e	30 " RCP	0.037	281	0.013	79	55				
* +M15f	30 " RCP	0.0158	198	0.013	52	59	C			
M15g	18 " RCP	0.184	136	0.013	45	10				

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS	UNIT COST	COST	
								REPLACEMENT PIPE	PIPE		
M15h	18 " RCP	0.148	128	0.013	40	7					
* +M20a1	24 " RCP	0.0343	344	0.013	42	85	C	33	160	55040	
* +M20a2	24 " RCP	0.0414	271	0.013	46	99	C	33	160	43360	
M20a3	18 " RCP	N/A	50	0.013		7	?				
* M20b	33 " RCP	0.065	185	0.013	135	113					
M25a	18 " ACP	0.005	106	0.013		7	7				
* +M25b	30 " RCP	0.006	[750]	0.013	32	42	C		24	130	97500
* +M25c1	30 " RCP	0.0057	175	0.013	31	58	C		30	150	26250
* M25c2	30 " RCP	0.0235	432	0.013	63	58					
* +M25d	30 " RCP	0.005	486	0.013	29	58	C		42	200	97266
* +M25e	36 " RCP	0.005	300	0.013	47	58	C				
M30a1	18 " RCP	0.088	115	0.013	31	23					
M30a2	18 " RCP	0.063	137	0.013	26	23					
M30b	PIPE	N/A				52	?				
* +M30c	60 " RCP	0.003	[2000]	0.013	143	250	C		54	260	520000
M30d1	18 " ACP	0.012	101	0.013	12	12					
M30d2	24 " ACP	0.025	36	0.013	36	32					
M30d3	30 " RCP	0.028	260	0.013	69	32					
N5a	18 " CMP	0.1	156	0.024	18	25	C,S				
N5b	18 " RCP	0.05	212	0.013	23	15					
N5c b=0 h=1 s=1:1		0.15		0.015	19	10					
05a	18 " ACP	0.0612	179	0.013	26	14					
05b1	30 " RCP	0.0035	446	0.013	24	20					
05b2	30 " RCP	0.0042	66	0.013	27	20					
* 06a (2) 5' X 3' RCB		0.006		0.013	254	192					
010a	18 " CMP	0.01	186	0.024	6	10	C,S				
* +010b1	24 " CMP	0.025	313	0.024	19	163	C,S	42	200	62600	
* +010b2	24 " CMP	0.03	400	0.024	21	163	C,S	42	200	80000	
* +010b3	24 " CMP	0.04	268	0.024	24	163	C,S	42	200	53600	
010c1	18 " CMP	0.01	114	0.024	6	10	C,S				
010c2	18 " RCP	0.1498	135	0.013	41	30					
* +010d	27 " RCP	0.0804	709	0.013	88	190	C	42	200	141720	
* +010e	36 " RCP	0.008	218	0.013	60	210	C		48	230	50172
* +010f	54 " RCP	0.002	160	0.013	89	230	C				
* +010g	65 " X 40 " CMPA	0.002	362	0.024	39	230	C,S	(2)7X4 RCB	975	352950	
* +010h	72 " X 44 " CMPA	0.002	322	0.024	51	260	C,S	(2)7X4 RCB	975	313950	
015a1	24 " CMP	0.025	225	0.024	19	117	C,S				
015a2 b=2' h=2' s=1.5:1		0.025	511	0.015	165	185	C				
015a3	24 " CMP	0.22	114	0.024	57	185	C,S				
015a4	18 " RCP	0.096	92	0.013	33	30					
015a5	27 " RCP	0.028	229	0.013	52	215	C				
015b	30 " CMP	0.031	449	0.024	39	215	C,S				
015c	30 " CMP	0.062	457	0.024	55	215	C,S				
* +015d	30 " RCP	0.009	168	0.013	39	114	C		33	160	26904
* +015e	33 " RCP	0.009	420	0.013	50	137	C	6X3 RCB	335	140630	
* +015f (2) 27 " RCP		0.008	154	0.013	55	166	C	6X3 RCB	335	51590	
* +015g	6' X 1.5' RCB	0.007	143	0.013	61	166	C				
* +015h	42 " RCP	0.004	160	0.013	64	166	C	SEE 010g			
* +015i	72 " X 44 " CMPA	0.0020	594	0.024	52	166	C,S	SEE 010h			

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST	COST
								PIPE	PIPE		
* 020a	(3) 4' X 6' RCB	0.005		0.013	657	475					
* 020b	[b=8' h=4' s=2:1]	[0.013]	600	0.03	661	475	E,M,?				
025a	18 " RCP	0.1158	149	0.013	36	34	C				
025b	18 " RCP	0.0964	166	0.013	33	40	C				
025c	21 " RCP	0.0145	243	0.013	19	45	C				
025d	21 " RCP	0.062	269	0.013	39	50	C				
025e	21 " RCP	0.0686	296	0.013	41	55	C				
025f	24 " RCP	0.0678	212	0.013	59	60	C				
* +025k	24 " RCP	0.005	212	0.013	16	64	C	42		200	42410
* +025l	30 " RCP	0.005	47	0.013	29	81	C			36	175
026a	[b=2' h=1.5' s=1.5:1]	0.043		0.03	59	193	C,E,V				
026b	18 " RCP	0.04	20	0.013	21	193	C				
026c	18 " RCP	0.01	78	0.013	11	193	C				
* +030a	30 " RCP	0.031	202	0.013	72	81	C				MINOR
* 030b	48 " RCP	0.035		0.013	269	81					
* 030c	48 " RCP	0.0156		0.013	179	81					
* 030d	69 " RCP	0.0078		0.013	334	331					
* 030e	(2) 5' X 3' RCB	0.0092		0.013	315	252					
035a	33 " RCP	0.0042	773	0.013	34	25					
* 035b	(2) 60 " RCP	0.0055	1539	0.013	386	331					
035c	18 " RCP	0.005	63	0.013	7	7					
035d	18 " RCP	0.013	238	0.013	12	10					
035e	18 " RCP	0.01	52	0.013	11	5					
035f	24 " RCP	0.024	179	0.013	35	8					
* +040a	33 " RCP	0.0042	710	0.013	34	35	C				MINOR
* +040b	(2) 54 " RCP	0.0095	635	0.013	383	430	C				MINOR
P5a1	24 " RCP	0.009		0.013	21	7					
P5a2	(2) 22" X 13" CMPA	N/A		0.024		10	S,?				
P10a	30 " CMP	0.01		0.024	22	60	C,S				
P10b	36 " CMP	0.0108		0.024	38	55	C,S				
P10c	5 ' X 4 ' RCB	N/A		0.013		118	?				
P10d	b=3' h=2' s=2:1	0.025		0.015	244	130	M				
* +P10e1	42 " RCP	0.0113	281	0.013	107	135	C				MINOR
* +P10e2	42 " RCP	0.0127	281	0.013	113	137	C				MINOR
* +P10e3	42 " RCP	0.0261	308	0.013	162	187	C				24 130 39975
* +P10e4	42 " RCP	0.0182	301	0.013	136	187	C				30 150 45075
* +P10e5	42 " RCP	0.0145	189	0.013	121	187	C				36 175 33075
P10e7	24 " RCP	0.0712		0.013	60	50					
P15a1	24 " RCP	0.1415	154	0.013	85	50					
P15a2	24 " RCP	0.0177	191	0.013	30	50	C				
P15a3	24 " RCP	0.036	478	0.013	43	55	C				
P15a4	24 " RCP	0.0528	397	0.013	52	60	C				
P15b	30 " RCP	0.01	368	0.013	41	70	C				
* +P15c	48 " RCP	0.0135	212	0.013	167	282	C			42 200 42400	
P15d	18 " RCP	0.007		0.013	9	30	C				
* +P15e	24 " RCP	0.0076	[1100]	0.013	20	118	C	48		230	253000
* +P15f	54 " RCP	0.0132	606	0.013	226	420	C			54 260 157560	
* +P15g	(2) 57" X 38" CMPA	0.01	[610]	0.024	132	476	C,S	(2) 60		515	314150
P15h	OPEN	N/A			56	?					

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS	UNIT	COST
								REPLACEMENT PIPE	PIPE	
P15i	(2) 42 " RCP	N/A		0.013	56	?				
* +P20a	4 " X 8 " RCB	0.0031	456	0.013	247	476	C		72	315 143640
* +P20b	84 " CSP	0.001	562	0.013	202	507	C,S		72	315 177030
* +P20c	78 " CIP	0.001	66	0.013	166	515	C		72	315 20866
* +P20d	(2) 4'X5' RCB	0.001	145	0.013	210	520	C		72	315 45675
* P20e	b=10' h=5' s=2:1	0.001	722	0.015	665	524				
* +P20f	(2) 5'X5' RCB	0.001	65	0.013	155	524	C	MINOR	42	200 72400
* +Q5b	33 " RCP	0.008	362	0.013	47	176	C		435	165680
* +Q5c	33 " RCP	0.01	380	0.013	53	230	C	8X4 RCB		
* +Q5d	36 " ACP	0.008	347	0.013	60	300	C	8X4 RCB	435	151374
Q5e	OPEN	0.0384		0.015		45	?			
Q5f	18 " ACP	0.045		0.013	22	45	C			
Q5g	30 " RCP	0.0384		0.013	80	55				
Q5h	30 " RCP	0.02		0.013	58	55				
Q5i	30 " RCP	0.01		0.013	41	55	C			
Q5j	24 " RCP	0.012	52	0.013	25					
Q5k	24 " RCP	0.005	56	0.013	16					
Q5l	21 " RCP	0.01	56	0.013	16					
Q5m	48 " RCP	0.037		0.013	276					
Q5n	24 " RCP	0.032		0.013	40					
* +Q10a	42 " RCP	0.0039	329	0.013	63	325	C	10X4 RCB	585	192512
* +Q10b	48 " RCP	0.004	375	0.013	91	340	C	10X4 RCB	585	219246
* +Q10c	48 " RCP	0.0060	649	0.013	111	365	C	10X4 RCB	585	379782
* +Q15a	48 " RCP	0.0075	302	0.013	124	425	C	10X4 RCB	585	176933
* +Q15b	(2) 39 " RCP	0.0046	842	0.013	113	475	C	10X4 RCB	585	492278
* +Q20a	(2) 42 " RCP	0.002	383	0.013	90	502	C	10X4 RCB	585	223997
* +Q25a	18 " RCP	0.0055	416	0.013	8	20	C	MINOR		
* +Q25b	18 " RCP	0.0023	267	0.013	5	36	C		175	46811
* +Q25c	21 " ACP	0.005	825	0.013	11	40	C		175	144445
* +Q25d	21 " ACP	0.0066	69	0.013	13	45	C		175	12024
* +Q25e	33 " RCP	0.004	674	0.013	33	65	C		200	134800
* +Q25f	33 " RCP	0.005	20	0.013	37	75	C		200	4000
* +Q25g	[b=3.5' h=2.5' s=1:1][0.003]	[650]		0.03	51	581	C,?	b=10 h=5 s=1.5:1 n=.03	150	97500
* +Q25h	b=6' h=4.5' RECT	0.003	620	0.015	322	600	C	OK		
* +Q25i	42 " RCP	0.003	180	0.013	55		C,?	8X5 RCB	470	84146
* +Q25j	49" X 33" CMPA	0.003	86	0.024	24		C,S,?	10X5 RCB	640	55040
* +Q25k	42 " RCP	0.003	325	0.013	55		C,?	10X5 RCB	640	208000
* +Q25l	[b=3' h=7 s=1.5:1] [0.003]	1570		0.03	573		C,?	b=10 h=6 s=1.5 n=.03	165	259050
Q25n	18 " RCP	0.0025	103	0.013	5	5				
Q25o	24 " RCP	0.01	47	0.013	23	5				
* +Q25p	18 " CMP	0.0256	116	0.024	9		S	8X5 RCB	470	54288
* +Q26a	18 " RCP	0.001	208	0.013	3	20	C	36	175	36400
Q26b	18 " RCP	0.0118	202	0.013	11	15	C			
Q26c	18 " RCP	0.002	322	0.013	5	10	C			
* Q26d	48 " RCP	0.0025	42	0.013	72	30				
Q26e	18 " CMP	0.05		0.024	13	5	S			
Q26f	24 " RCP	N/A		0.013		10	?			
* +Q30a	18 " RCP	0.0014	[300]	0.013	4	70	C	(2) 54 EXTEND TO	490	147000
* +Q30b1	28 " X 20 " CMPA	0.007	48	0.024	9	131	C,S	(2) 54 BUENA VISTA	490	23520

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CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS PIPE	UNIT COST	COST	
								REPLACEMENT PIPE PARALLEL			
* +Q30b2	28 " x 20 " CMPA	0.006	42	0.024	8	51	C,S	36	175	7350	
* +Q30c	24 " CMP	0.006	462	0.024	9	131	C,S	8x5 RCB	470	217140	
* +Q30d	24 " CMP	0.006	98	0.024	9		C,S,?	OK			
* +Q30e	24 " CMP	0.0058	208	0.024	9		C,S,?	OK			
* +Q30f	36 " CMP	0.0045	448	0.024	24		C,S,?	OK			
* +Q30g	64 " x 43 " CMPA	0.0025	1232	0.024	44		C,S,?	OK			
* +Q30h	71 " x 47 " CMPA	0.0025	664	0.024	57		C,S,?	OK			
* +Q30i	(2) 54 " RCP	0.003	2500	0.013	215		C,S,?	OK			
* +Q31a	64 " x 43 " CMPA	0.008	12	0.024	79	628	C,S	OK			
Q31b1	18 " CMP	0.004		0.024	4		S				
Q31b2	18 " RCP	0.0014		0.013	4						
Q31b3	18 " RCP	0.0029	510	0.013	6						
* +Q31c1	30 " CMP	0.0024	448	0.024	11		C,S,?	OK			
* +Q31c2	24 " CMP	0.004	540	0.024	8		C,S,?	OK			
* +Q31c3	30 " CMP	0.0025	276	0.024	11		C,S,?	OK			
* +Q31d	50 " x 31 " CMPA	0.0025	751	0.024	22		C,S,?	OK			
* +Q31e	49 " x 33 " CMPA	0.0025	282	0.024	22		C,S,?	OK			
* +Q31f	64 " x 43 " CMPA	0.0062	130	0.024	69		C,S,?	OK			
Q35a	18 " RCP	0.001	364	0.013	3						
* +R5a	27 " RCP	0.003	307	0.013	17	24	C	MINOR			
* +R5b	33 " RCP	0.0048	333	0.013	37	27		MINOR			
* +R5c	33 " RCP	0.003	296	0.013	29	47	C	MINOR			
* +R10a	36 " RCP	0.002	315	0.013	30	54	C	MINOR			
* +R10b	24 " RCP	0.0017	253	0.013	9	61	C	36	175	44275	
R15b	42 " RCP	0.0024		0.013	49	49					
R15c	36 " RCP	0.0032		0.013	38	35					
R15d	36 " CIP	0.0179		0.013	89	25					
R15e	36 " CIP	0.0024		0.013	33	14					
R15h	b=3' h=4" RECT.	0.005	120	0.015	89	14					
R15i	18 " RCP	0.005		0.013	7	10	C	MINOR			
* +R20a	54 " RCP	0.0023	[500]	0.013	94	100	C				
S5a	18 " RCP	0.006		0.013	8	45	C				
S5b	42 " RCP	0.002	291	0.013	45	50	C				
* S5c	48 " RCP	0.0129	473	0.013	163	65					
S15a	15 " RCP	0.004		0.013	4	20	C				
* +S15b	35 " x 24 " CMPA	0.0036	178	0.024	11	28	C,S	(2) 24	220	39160	
* +S15c	30 " RCP	0.005	277	0.013	29	70	C		36	175	48416
* +S15d	36 " RCP	0.005	159	0.013	47	95	C		36	175	27790
* +S15e	48 " RCP	0.0026	847	0.013	73	110	C		42	200	169428
* +S15f	48 " RCP	0.0049	280	0.013	101	120	C	MINOR			
* S15g	54 " RCP	0.0052	244	0.013	142	130					
* S15h	54 " RCP	0.0064	435	0.013	158	148					
S15i	24 " RCP	0.014		0.013	27	27					
S15j	24 " RCP	0.0036		0.013	14	14					
S15k	18 " RCP	0.005		0.013	7	7					
S15l	36 " RCP	0.0076	150	0.013	58	148	C				
T5a	18 " RCP	0.0193		0.013	15	10					
T5b	30 " RCP	0.0178	61	0.013	55	62	C				
* +T5c	30 " RCP	0.01	253	0.013	41	62	C		24	130	32937

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS PIPE	UNIT PIPE	COST
* +T5d	(2) 24 " RCP	0.01	88	0.013	45	62	C	MINOR		
T5e	18 " RCP	0.0232		0.013	16	10				
T5f	18 " RCP	0.015		0.013	13	12				
T25a	30 " CMP	N/A		0.024		99	S,?			
T25b	OPEN	N/A		0.03		115	?			
T25c	18 " CMP	N/A		0.024		15	S,?			
T25d	OPEN	N/A		0.03		25	E,?			
T25e	(2) 36 " CMP	N/A		0.024		140	M,S			
T30a1	N/A						?			
T30a2	OPEN	N/A		0.03		200	?			
T30b	6' x 3 ' RCB	N/A		0.013		211	M,?			
T30c	OPEN	N/A		0.015		211	M,?			
* +U5a1	43 " x 27 " CMPA	0.013	72	0.024	35	64	C,S	36	175	12535
* +U5a2	43 " x 27 " CMPA	0.016	49	0.024	38	64	C,S	36	175	8510
* U5b	36 " RCP	0.028	217	0.013	112	75				
* U5c	42 " RCP	0.0071	296	0.013	85	75				
* U5d	48 " RCP	0.0073	267	0.013	123	110				
U5e	30 " RCP	0.135	210	0.013	151	40				
U5f	30 " ACP	0.0135		0.013	48	20				
U5g	24 " ACP	0.0247	150	0.013	36	20				
U5h	29 " x 18 " CMPA	0.006	46	0.024	8	10	C,S			
U5i	18 " ACP	0.0143	201	0.013	13	20	C			
U6a	24 " CMP	[0.01]	60	0.024	12	10				
U6b	21 " RCP	0.01	920	0.013	16	10				
U6c	[b=5 h=3 s=2:1]	0.006	280	0.013		12	?			
U6d	30 " CMP	0.022	54	0.024	33	10	S			
* U10a	54 " RCP	0.0052	690	0.013	142	110				
* +U20a	28 " x 20 " CMPA	0.0051	1166	0.024	7	58	C,S	42	200	233200
* +U20b	30 " CMP	0.0037	394	0.024	14	68	C,S	42	200	78800
* +U20c	28 " x 20 " CMPA	0.0018	108	0.024	4	15	C,S	MINOR		
* +U20d	43 " x 27 " CMPA	0.0018	450	0.024	13	15	C,S	MINOR		
U20e	(2) 36 " RCP	0.0035		0.013	79	25				
U20f	OPEN	N/A				30	?			
* U20g	(2) 58" x 36" CMPA	0.005		0.024	93	50	S			
* U20h	72 " x 44 " CMPA	0.0065	240	0.024	92	50	S			
U20i	OPEN	N/A				5	?			
U20j	28 " x 20 " CMPA	0.0039	76	0.024	6	25	C,S			
* V25a	[b=10 h=8 s=1.5:1]	[0.02]	2300	0.015	6752	1000	?			
* V25b	(2) 8' x 5' RCB	0.0322		0.013	2794	1111				
* +V30a1	b=10 h=4.5 s=1.5:1	0.005	[100]	0.015	1067	1175	C,E,M	MINOR		
* +V30a2	[b=16' h=3' s=1:1]	[0.019]	[200]	0.03	684	1175	C,?	b=12 h=5.5 s=1.5 n=.03	155	31000
* V30b	(2) 8' x 5' RCB	[0.019]		0.013	1680	1290	?			
* V35a	[b=12 h=6 s=1.5:1]	[0.019]		0.015	4150	1300	M,?			
* V40a	(2) 9' x 4' RCB	0.012		0.013	1487	1312				
* V40b	(2) 8'x4.75' RCB	0.012	602	0.013	1596	1350				
* V40c	b=10' h=5' s=1.5:1	0.0148	1155	0.015	2253	1381				
* +V40d	(2) 10' x 4' RCB	0.0062	74	0.013	913	1381	C,M	MINOR		
V45a	18 " RCP	0.005		0.013	7	5				
V45b	18 " RCP	0.0111		0.013	11	10				

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST	CCOST
								REPLACEMENT PIPE	PARALLEL PIPE		
* V45c	27 " RCP	0.009		0.013	29	25					
* +V45d	b=5' h=5' s=1.5:1	0.0181	[800]	0.03	810	1387	C,E,M	b=8 h=5 s=1.5 n=.015		230	184000
* +V45e1	(2) 6" X 5" RCB	0.0089	150	0.013	796	1387	C		MINOR		
* +V45e2	(2) 6" X 5" RCB	0.0192	96	0.013	1169	1387	C		MINOR		
* V45f	b=12' h=6' s=1.5:1	0.0192	278	0.015	4172	1400					
V45g	24 " RCP	0.005	105	0.013	16	15					
V45h	21 " RCP	0.005	300	0.013	11	10					
V45i	24 " RCP	0.005	300	0.013	16	15					
* V45j	b=12 h=6 s=1.5:1	0.006	462	0.015	2332	1455					
* +V45k	[b=7 h=5 s=1.5:1]	0.006	400	0.03	565	1472	C,?	b=12 h=6 s=1.5 n=.015		380	152000
* +V50a	(4) 8" X 3" RCB	0.0135	99	0.013	1351	1472	C,M		MINOR		
* V50b	[b=20'h=10s=1.5:1]	0.006		0.03	4553	1472	E,M,V				
V50c1	(2) 22" X 13" CMPA	0.005	100	0.024	7	15	C,S				
V50c2	24 " RCP	0.016	304	0.013	29	15					
V50d	24 " CMP	0.01	104	0.024	12	15	C,S				
V50e1	20 " X 28 " CMPA	0.0042	36	0.024	7	15	C,S				
V50e2	24 " CMP	0.004	340	0.024	8	15	C,S				
V50f	b=0' h=1' s=1.5:1	0.01	100	0.015	8	30	C				
W15a	36 " RCP	0.03	289	0.013	115	120	C				
W15b	36 " RCP	0.0381	253	0.013	130	120					
W15c	36 " RCP	0.03	375	0.013	115	130	C				
W15d	42 " RCP	0.0197	270	0.013	141	130					
W15e	42 " RCP	0.0162	247	0.013	128	130	C				
W15f	49 " X 33 " CMPA	0.012	36	0.024	48	130	C,S				
W15g	(2) 49" X 33" CMPA	0.0106	89	0.024	91	136	C,S				
W15h	18 " RCP	0.01	111	0.013	11	10					
W20a	30 " RCP	0.032	125	0.013	73	90	C				
W20b	30 " RCP	0.051	295	0.013	93	100	C				
W20c	30 " RCP	0.03	141	0.013	71	105	C				
W20d	36 " RCP	0.022	76	0.013	99	110	C				
W25a	43 " X 27 " CMPA	0.025		0.024	48	30	S				
W25b	36 " CIPP	0.023		0.013	101	42					
W25c	36 " CIPP	0.01		0.013	67	58					
W30a	22 " X 13 " CMPA	0.003		0.024	3	8	C,S				
W30b	16 " RCP	0.006		0.013	6	10	C				
W30c	22 " X 13 " CMPA	0.014		0.024	5	5	S				
W30d	20 " RCP	0.0178		0.013	19	12					
W30e	36 " CMP	0.01		0.024	36	70	C,S				
W35a	24 " CMP	0.011	280	0.024	13	51	C,S				
W35b	(2) 71" X 47" CMPA	0.01	100	0.024	229	51	S				
W35c	18 " CMP	0.0139	114	0.024	7	10	C,S				
W35d	24 " CMP	0.0377		0.024	24	15	S				
W35e	24 " CMP	0.0173		0.024	16	25	C,S				
W35f	24 " CMP	0.0175		0.024	16	15	S				
W35g	18 " CMP	0.0065		0.024	5	5	S				
W35h	12 " RCP	N/A		0.013		5	?				
W35i	24 " CMP	0.0075		0.024	11	10	S				
W35j	24 " CMP	0.0244	94	0.024	19	15	S				
* X10a	[b=6' h=4' s=1:1]	0.05		0.03	774	350	E,M,?				

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LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST
								PIPE	PIPE	
* X10b	[b=20" h=3' s=2:1]	[0.025]		0.03	1520	960	E,M,?			
X10c	24 " RCP	N/A		0.013		20	?			
X10d	24 " RCP	N/A		0.013		20	?			
* +X15a (2) 3.5' X 6' RCB	0.01	[50]	0.013	513	995	C,M			MINOR	
X15b	18 " RCP	0.014	36	0.013	12	20	C			
X15c	18 " RCP	0.039	111	0.013	21	25	C			
X15d	18 " RCP	0.047	60	0.013	23	25	C			
X15e	18 " RCP	0.006	97	0.013	8	25	C			
X15f	18 " RCP	0.014	36	0.013	12	30	C			
X15g	24 " RCP	0.47	48	0.013	155	30	V			
X15h	24 " RCP	0.0165	130	0.013	29	30	C			
X15i	24 " RCP	0.012	190	0.013	25	35	C			
X15j [b=1.5'h=1.5's=1:1]	0.0047	200	0.03		13	35	C			
X15k [b=1.5'h=1.5's=1:1]	0.02	100	0.03		27	35	C,E,V			
X15l [b=1.5'h=1.5's=1:1]	0.15	80	0.03		73	35	E,V			
X15n	24 " RCP	N/A	67	0.013		40	?			
X15o	18 " RCP	0.0161	421	0.013	13	40	C			
X15p	18 " RCP	0.04	169	0.013	21	40	C			
X15q	18 " RCP	0.0518	112	0.013	24	45	C			
X15r	18 " RCP	0.0867	40	0.013	31	45	C			
X15s	18 " RCP	0.051	151	0.013	24	45	C			
X15t	18 " RCP	0.01	204	0.013	11	45	C			
X15u	18 " CMP	0.0417	137	0.024	12	45	C,S			
* X15v [b=20' h=3' s=1:1]	[0.025]			0.03	1520	1021	E,M,?			
X20a	18 " RCP	0.1438	122	0.013	40	12				
* X20b	72 " RCP	0.014		0.013	501	1032	C,M			
X20c (2) 4' X 4' RCB	0.06			0.013	896	50	M			
X30a	18 " RCP	0.015		0.013	13	10				
X30b	18 " RCP	0.01		0.013	11	10				
X30c	30 " CIP	0.0292		0.013	70	50				
X30d	42 " CIP	0.005		0.013	71	70				
X30e	60 " CIP	0.01		0.013	260	85				
Y10a	36 " RCP	0.06	236	0.013	163	259	C			
Y10b	36 " RCP	0.066	480	0.013	171	262	C			
Y10c	36 " RCP	0.033	83	0.013	121	265	C			
Y10d	OPEN	N/A	200			265	E,M,?			
Y10e	36 " RCP	0.0185	85	0.013	91	265	C			
Y10f	36 " RCP	0.1	140	0.013	211	270	C			
Y10g	36 " RCP	0.038	160	0.013	130	270	C			
Y10h	36 " RCP	0.062	163	0.013	166	289	C			
* +Y15a	36 " RCP	0.0138	232	0.013	78	289	C			48
* +Y15b	48 " CIP	0.0395	563	0.013	285	289	C		MINOR	230
Y15c1	18 " RCP	0.028	1645	0.013	18	10				53360
Y15c2	18 " RCP	0.02	178	0.013	15	15				
Y15c3	24 " RCP	0.02	94	0.013	32	28				
* Y15d	54 " CIP	0.026	475	0.013	317	316				
* Y15e (2) 42 " CIP	0.0301	110	0.013		349	342	M			
Y15f	30 " RCP	0.012		0.013		45	26			
* +Y15g1	28 " x 20 " CMPA	0.0245	72	0.024	16	27	C,S	24		130
										9360

* = MASTER DRAINAGE FACILITY + = DEFICIENT MASTER DRAINAGE FACILITY [] = ESTIMATED VALUE

DEFICIENCIES: C = CAPACITY E = EROSION M = MAINTENANCE S = SERVICE LIFE V = VELOCITY ? = NOT ENOUGH DATA

CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS		UNIT COST
								REPLACEMENT PIPE	PARALLEL PIPE	
* +Y15g2	24 " CMP	0.035	100	0.024	23	27	C,S		MINOR	
* +Y15h	18 " RCP	0.005	58	0.013	7	13	C		MINOR	
* Y15i	24 " CMP	0.0159	22	0.024	15	14	S			
Y20a	24 " CIP	0.0263	152	0.013	37	37				
Y20b	24 " CIP	0.0713	163	0.013	60	37				
Y20c	24 " CIP	0.0676	236	0.013	59	37				
Y20d	24 " CIP	0.0211	294	0.013	33	37	C			
Y20e	24 " CIP	0.0853	219	0.013	66	37				
Y20f	30 " CIP	0.0221	241	0.013	61	37				
Y20g	42 " x 29 " CMPA	0.0253	79	0.024	48	37	S			
Z10a	24 " CMP	0.1283	366	0.024	44	45	C,S			
Z10b	24 " CMP	0.069	210	0.024	32	55	C,S			
Z10c	30 " CMP	0.0297	54	0.024	38	66	C,S			
Z10d	30 " CMP	0.4726	61	0.024	153	70	S			
Z10e	27 " CMP	0.0441	103	0.024	35	75	C,S			
Z10f	27 " CMP	0.1017	167	0.024	53	80	C,S			
Z10g	30 " CMP	0.0098	131	0.024	22	82	C,S			
Z10h	30 " CMP	0.6462	29	0.024	179	84	S,V			
Z10i	30 " CMP	0.0116	88	0.024	24	93	C,S			
Z10j	30 " CMP	0.011	44	0.024	23	100	C,S			
Z10k	30 " CMP	0.0102	123	0.024	22	108	C,S			
Z10l	30 " CMP	0.4208	53	0.024	144	118	S			
Z10m	30 " CMP	0.0251	177	0.024	35	125	C,S			
Z10n	30 " CMP	0.018	68	0.024	30	135	C,S			
Z10o	30 " CMP	0.4639	33	0.024	151	145	S			
Z10p	30 " CMP	0.001	212	0.024	7	152	C,S			
Z10q	30 " CMP	0.379	16	0.024	137	159	C,S			
Z10r	30 " CMP	0.011	110	0.024	23	165	C,S			
Z10s1	36 " CMP	0.0086	208	0.024	33	150	C,S			
Z10s2	18 " CMP	0.0086	187	0.024	5	20	C,S			
Z10t1	36 " CMP	0.2311	37	0.024	174	155	S			
Z10t2	18 " CMP	0.2311	37	0.024	27	25	S			
Z10u	18 " RCP	0.01	1814	0.013	11	10				
Z15a1	36 " RCP	0.0326		0.013	120	40				
Z15a2	24 " RCP	0.0326		0.013	41	30				
Z15b1	36 " RCP	0.0326	115	0.013	120	186	C			
Z15b2	24 " RCP	0.0326	115	0.013	41	186	C			
Z15b3 [b=10'h-varies s=1:1]	0.005		170	0.03		186	?			
Z20a	24 " CMP	0.0051		0.024	9	45	C,S			
Z25a	54 " RCP	0.032		0.013	352	140				
Z25b	30 " RCP	0.0279		0.013	68	45				
Z25c	54 " RCP	0.032		0.013	352	266				
Z25d	24 " RCP	0.008		0.013	20	115	C			
Z25e	21 " RCP	0.017	204	0.013	21	10				
* Z25f	54 " RCP	0.0324	1032	0.013	354	286				
* Z25g [b=14' h=2.5' s=1:1] [0.039]				0.03	631	359	?			
* +Z25h	18 " CMP [0.039]	[40]		0.024	11	359	C,S,?	6X3 RCB		335
* +Z25i [b=6' h=2.5' s=1:1] [0.039]	[400]			0.03	264	359	C,?	b=6 h=4 s=1.5 n=.03	85	34000
* +Z25j	48 " RCP	0.0178	[50]	0.013	192	359	C		48	230
										11500

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DEFICIENCIES: C = CAPACITY E = EROSION M = MAINTENANCE S = SERVICE LIFE V = VELOCITY ? = NOT ENOUGH DATA

CITY OF SANTEE --- SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS

LINE	SIZE	SLOPE	LENGTH (FT)	N VALUE	CAPACITY (CFS)	100-YEAR FLOW (CFS)	DEFICIENCY RATING	RECOMMENDATIONS REPLACEMENT PIPE PARALLEL PIPE	UNIT COST	COST
Z26a	30 " CMP	0.046		0.024	48	30	S			
* +Z26b	36 " CMP	0.0678	[500]	0.024	94	170	C,S	36	175	87500
* Z26c	42 " RCP	0.12		0.013	348	200	V			
* +Z26d	24 " CMP	0.03	[700]	0.024	21	140	C,S	42	200	140000
Z35a	24 " CMP	0.01		0.024	12	8	S			
Z35b	24 " RCP	0.079		0.013	64	5				
Z35c	24 " RCP	0.01		0.013	23	23				
Z35d	b=2' h=2' RECT.	0.01		0.015	30	38	C,M			
Z35e	(2) 25" X 16" CMPA	0.041		0.024	29	38	C,S			
Z35f	25 " X 16 " CMPA	0.012		0.024	8	5	S			
Z35g	30 " CMP	0.01		0.024	22	42	C,M,S			
Z35h	OPEN	N/A				42	?			
Z35i	30 " RCP	N/A		0.013		42	?			

* = MASTER DRAINAGE FACILITY + = DEFICIENT MASTER DRAINAGE FACILITY [] = ESTIMATED VALUE

DEFICIENCIES: C = CAPACITY E = EROSION M = MAINTENANCE S = SERVICE LIFE V = VELOCITY ? = NOT ENOUGH DATA

APPENDIX III

SUMMARY PRINTOUT

STUDY NAME: CITY OF SANTE --- BASIN A

100 0-YEAR STORM PROTECTION METHODS STUDY

CALCULATED BY: NDB
CHECKED BY:
PAGE NUMBER 1 OF 5

100-YEAR STORM NATIONAL METHOD STUDY							ADVICE			ENGINEERING SOFTWARE							PAGE NUMBER 1 OF 53					
CONCENTRATION POINT NUMBER			AREA (ACRES)		SOIL DEV.		TOTAL		TYPE		TC MIN.		C MIN.		Q (SUB)		PATH TOTAL		SLOPE V FT/FT FPS.	HYDRAULICS AND NOTES		
2.00	10.0	10.0	4	6	..	11.9	3.76	.450	16.9	16.9	..	..	..	..	..	..	700	.3000	..	INITIAL SUBAREA		
3.00	71.0	81.0	4	6	5.6	17.5	2.93	.450	93.7	110.7	..	..	..	..	..	..	2000	.0625	6.0	*Qav= 16.9 cfs	n=.0400	Dn= 1.2
4.00	53.0	134.0	4	6	2.9	20.4	2.66	.450	63.5	174.1	..	..	..	..	..	..	1500	.0467	8.7	*Qav= 110.7 cfs	B=.0	Z= 2.0
5.00	43.0	177.0	4	6	3.5	23.9	2.40	.450	46.4	220.5	..	..	..	..	..	..	1700	.0271	8.0	*Qav= 174.1 cfs	n=.0400	Dn= 3.3
5.00	177.0	..	..	..	..	23.9	2.40	..	..	220.5	..	..	..	..	..	..	..	..	..	B=.0	Z= 2.0	
7.00	10.0	10.0	4	6	..	12.5	3.65	.450	16.4	16.4	..	..	..	..	..	..	1000	.3230	..	INITIAL SUBAREA		
8.00	40.0	50.0	4	6	3.8	16.2	3.08	.450	55.5	71.9	..	..	..	..	..	..	1500	.0373	7.1	*Qav= 71.9 cfs	n=.0400	Dn= 2.2
5.00	38.0	88.0	4	6	3.5	19.7	2.72	.450	46.5	118.4	..	..	..	..	..	..	..	..	..	B=.0	Z= 2.0	

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

STUDY NAME: CITY OF SANTEE --- BASIN A

100 0-YEAR STORM RATIONAL METHOD STUDY

* DEVELOPMENT TYPES : 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
5=SPECIFIED RUNOFF COEFFICIENT*

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN B

CALCULATED BY : NDB

CHECKED BY :

PAGE NUMBER 3 OF 53

100.0-YEAR STORM RATIONAL METHOD STUDY

[A D V A N C E D E N G I N E E R I N G S O F T W A R E]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SOIL DEV. TOTAL	TOTAL TYPE	T _C MIN.	T _T MIN.	Q (SUB)	PATH SLOPE TOTAL (ft/ft)	V FPS.	HYDRAULICS AND NOTES
10.00	9.1	..	19.0	..	..	14.0	..	..	ASSUMED DATA
30. ft-STREET FLOW TO PT.#	14.5	23.6	4	5	1.1	20.1	2.69	.550	Qav= 24.7 cfs DEPTH=.42 ft. FLOODWIDTH=14.6
15.00	14.5	23.6	4	5	..	..	..	..	n=.0130 Dr=.8 30.0"-PIPE
20.00	7.8	31.4	4	5	.5	20.6	2.65	.550	*Qav= 35.4 cfs n=.0130 Dr=.8 30.0"-PIPE
25.00	23.0	54.4	4	5	..	21.6	2.56	.550	*Qav= 46.8 cfs n=.0130 Dr=.7 30.0"-PIPE
27.00	10.0	10.0	4	6	..	13.4	3.49	.450	INITIAL SUBAREA Qav= 15.7 cfs n=.0400 Dr= 1.3 B= .0 Z= 2.0
30.00	32.0	42.0	4	6	4.6	18.0	2.88	.450	1350 .0370 4.9
35.00	16.1	58.1	4	5	3.4	21.4	2.58	.550	1250 .0280 6.1
39.00	9.1	..	..	..	..	..	..	..	*Qav= 57.2 cfs n=.0400 Dr= 2.2 B= .0 Z= 2.0
30. ft-STREET FLOW TO PT.#	40.00	16.1	4	5	1.8	20.7	2.63	.550	ASSUMED DATA Qav= 19.0 cfs DEPTH=.37 ft. FLOODWIDTH=12.0
40.00	7.0	16.1	4	5	..	..	..	..	0,5=SPECIFIED RUNOFF COEFFICIENT*

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0,5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE ---- BASIN B

100.0-YEAR STORM RATIONAL METHOD STUDY

POINT NUMBER	SUBAREA	TOTAL AREA (ACRES)	SOIL DEV.	ENGINEERING			SOFTWARE			HYDRAULICS AND NOTES
				TOTAL	TYPE	MIN.	MIN.	1in/h	(SUB)	
44.00		9.0		..	25.7				11.4	
30-ft-STREET FLOW TO PT.# 45.00		9.6	18.6	4	5	2.8	28.4	2.15	800	*Qav= 17.0cfs DEPTH=.38 ft. FLOODWIDTH=12.9
		45.00	18.6							STREAM SUMMARY
		45.00	18.6			28.4				

CALCULATED BY: NDB
CHECKED BY:

PAGE NUMBER 4 OF 53

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 * 0,5=SPECIFIED RUNOFF COEFFICIENT
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

STUDY NAME: CITY OF SANTEE --- BASIN C

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT	NUMBER	SUBAREA	ADVANCED			ENGINEERING			SOFT			PAGE NUMBER	CHECKED BY:	CALCULATED BY: NDB	
			AREA (ACRES)	SOIL DEV.	TOTAL	TYPE	MIN.	TC	I	C	Q	TOTAL	V		
2.00	1.4	1.4	4	6	..	12.0	3.90	.450	2.5	2.5	250	.0360	..	INITIAL SUBAREA	
3.00	8.4	9.8	4	5	2.8	..	14.8	3.40	.550	15.7	18.3	450	.0733	2.7	*Qav= 2.5 cfs n=.0400 Dn=.2 B=.5.0 Z=.20
5.00	24.2	34.1	4	5	1.1	15.9	3.25	.550	43.3	61.5	..	900	.0411	13.2	*Qav= 18.3 cfs n=.0130 Dn=.9 24.0"-PIPE
7.00	10.0	10.0	4	6	..	13.9	3.55	.450	16.0	16.0	1000	.1000	..	INITIAL SUBAREA	
30.ft-STREET FLOW TO PT.#	10.00	18.5	28.5	4	3.2	..	17.0	3.11	.550	31.6	47.6	1200	.0392	7.7	*Qav= 31.7 cfs DEPTH=.44 ft. FLOODWIDTH=15.0
13.00	8.5	8.5	4	6	..	13.5	3.61	.450	13.8	13.8	1200	.1883	..	INITIAL SUBAREA	
14.00	18.0	26.5	4	6	2.6	16.1	3.23	.450	26.1	39.9	1000	.0800	6.4	*Qav= 13.8 cfs n=.0400 Dn=1.0 B=.0 Z=.20	
15.00	27.0	53.5	4	5	1.5	17.5	3.05	.550	45.3	85.2	1400	.0429	16.0	*Qav= 39.9 cfs n=.0130 Dn=1.5 24.0"-PIPE	

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots
 0,5=SPECIFIED RUNOFF COEFFICIENT*

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,

0,5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN C

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	ENGINEERING			SOFTWARE			HYDRAULICS AND NOTES
			TOTAL	TYPE	MIN.	TC	I	C	
INITIAL SUBAREA									
18.00	8.5	8.5	.	6	12.4	3.82	.450	14.6	*Qav= 14.6 cfs n=.0400 Dn= 1.0 B= .0 Z= 2.0
19.00	20.0	28.5	4	6	3.4	15.8	3.26	.450	44.0
20.00	23.0	51.5	4	5	1.1	16.9	3.13	.550	39.6
23.00	8.5	8.5	.	6	12.6	3.77	.450	14.4	1000 .2800 ..
24.00	14.0	22.5	4	6	3.0	15.6	3.29	.450	20.7
25.00	8.5	31.0	4	5	.5	16.1	3.22	.550	15.1
28.00	7.1	7.1	4	6	..	12.4	3.81	.450	12.2
29.00	40.0	47.1	4	6	5.0	17.4	3.06	.450	55.1
									67.2
									600 .0833 23.7
									n=.0130 Dn= 1.5 27.0"-PIPE

SOIL TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots
 0,5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN C

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CHECKED BY : 7 OF 53

CONTINUATION OF SANTEE - BASTIN C

STUDY NAME: CITY OF SANTEE --- BASIN C

100.0-YEAR STORM RATIONAL METHOD STUDY										SOFTWARE			PAGE NUMBER 8 OF 53		
[A D V A N C E D]			ENGINEERING							HYDRAULICS					
CONCENTRATION	AREA (ACRES)	SOIL DEV.	TC	I	C	Q	PATH SLOPE	V	AND NOTES						
POINT NUMBER	SUBAREA	TOTAL	TYPE	MIN.	MIN.	(SUB)	ft/ft	fps.							
39.00	168.0	331.8	4	6	---	23.4	2.53	.450	191.4	393.1	1245	.0482	12.0	*Qav= 393.1 cfs	
						1.9					1255	.0637	11.3	*Qav= 201.7 cfs	
											n=.0400	Dn= .3-0			
											B= .0	Z= 2.0			

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								B=	.0	Z=	2.0
43.00	88.0	419.8	4	6	---	1.7	25.1	2.42	.450	95.8	488.8
CONFLUENCE	TC#1 =	64.3	TC#2 =	25.1	TC#3 =	.0	TC#4 =	.0	TC#5 =	.0	LARGEST CONFLUENCE
ANALYSIS	Q#1 =	95.9	Q#2 =	488.8	Q#3 =	.0	Q#4 =	.0	Q#5 =	.0	Q = 541.2
FOR POINT#	I#1 =	1.32	I#2 =	2.42	I#3 =	.00	I#4 =	.00	I#5 =	.00	
43.00	Q1 =	3622.6	Q2 =	5411.2	Q3 =	.0	Q4 =	.0	Q5 =	.0	
										500	*Qav= 541.2cf/s
										n=.0400	Dn= 4.7

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*Qav= 554.9cf6
 n=.0130 Dn= 3.5
 54.0"-PIPE
 STREAM SUMMARY

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SOIL TYPES: 1=A, 2=B, 3=C, 4=D

DEVELOPMENT: 1 = Initial, 2 = Current, 3 = Final

4 MIGRATION AND THE STATE IN AFRICA

THE JOURNAL OF CLIMATE

STUDY NAME: CITY OF SANTEE ---- BASIN D

CALCULATED BY: NDB

CHECKED BY:

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100.0-YEAR STORM RATIONAL METHOD STUDY

POINT NUMBER	SUBAREA	ENGINEERING			SOFTWARE			HYDRAULICS AND NOTES
		TOTAL	TYPE	MIN.	Tc	Tt	Q (SUB)	
2.00		11.5		11.5	...	13.6	22.7	*Qav= 59.4 cfs DEPTH=.50 ft. FLOODWIDTH=18.9
60.ft-STREET FLOW TO PT.# 5.00	39.8	51.2	4	5	2.5	16.1	3.35 .550 73.2 95.9	.0650 9.3 n=.0350 Dn= 2.2 B=.0 Z= 2.0
10.00	23.6	74.8	4	5	2.9	19.0	3.01 .550 39.1 135.0	
12.00	2.8	2.8	4	5	...	15.8	3.39 .550 5.2 5.2	
60.ft-STREET FLOW TO PT.# 15.00	12.2	15.0	4	5	4.9	20.7	2.85 .550 19.0 24.3	
17.00		2.9		2.9	...	8.0	8.1	
30.ft-STREET FLOW TO PT.# 20.00	9.4	12.3	4	5	3.1	11.0	4.27 .550 22.0 30.1	
22.00		6.7		6.7	...	8.9	17.5	
30.ft-STREET FLOW TO PT.# 23.00	4.3	11.0	4	5	1.8	10.7	4.35 .550 10.3 27.8	
								ASSUMED DATA

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 *DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots
 0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF Santee --- BASIN D

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	TOTAL SUBAREA	A D V A N C E D		E N G I N E E R I N G		S O F T W A R E	
			SOIL DEV.	TOTAL TYPE	MIN. TYPE	MIN. IN/h	(SUB) Q	TOTAL (ft) Q
24.00	4.7	15.7	4	5	1.0	11.7	4.12	.550 10.6
25.00					.2			
25.00		15.7				11.9	4.07	
27.00					.	18.9		
30. ft-STREET FLOW TO PT.#	25.00	1.6	9.6	4	5	1.5	20.4	2.87 .550 2.6
CONFLUENCE ANALYSIS FOR POINT#	TC#1= 11.9 Q#1= 38.4 I#1= 4.07 25.00 Q1 = 49.2	TC#2= 20.4 Q#2= 15.2 I#2= 2.87 Q2 = 42.3	TC#3= .0 Q#3= .0 I#3= .00 Q3 = .0	TC#4= .0 Q#4= .0 I#4= .00 Q4 = .0	TC#5= .0 Q#5= .0 I#5= .00 Q5 = .0			
30.00	3.3	28.6	4	5	.3	12.2	4.01 .550 7.2	
32.00					.	9.2		
30. ft-STREET FLOW TO PT.#	35.00	21.4	26.2	4	5	2.0	11.2	4.23 .550 49.7
								61.9

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CHECKED BY:

PAGE NUMBER 10 OF 53

HYDRAULICS

AND NOTES

1000	.0610	17.1	*Qav= 27.8 cfs n=.0130 Dn= 1.0 24.0"-PIPE
------	-------	------	---

FOR CONFLUENCE

ASSUMED DATA

150	.0267	13.4	*Qav= 38.4 cfs n=.0130 Dn= 1.5 27.0"-PIPE
-----	-------	------	---

LARGEST CONFLUENCE

Q= 49.2

530	.0566	5.6	*Qav= 14.0 cfs DEPTH=.33 ft. FLOODWIDTH=10.4
-----	-------	-----	--

ASSUMED DATA

DEPTH=.33 ft.

370	.0703	20.4	*Qav= 49.2 cfs n=.0130 Dn= 1.4 24.0"-PIPE
-----	-------	------	---

SOIL TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

, 0, 5=SPECIFIED RUNOFF COEFFICIENT

SPRING NAME: CITY OF SANTEE --- BASTIN D

100.0-YEAR STORM RATIONAL METHOD STUDY

1=Industrial, 2=Commercial, 3=Multi-Unit,
4=Mobile Home, 5=Single Family, 6=Rural Lots

A MODEL HOME, SIMPLY, 18 MULY, 6-AUGUST

5-SPECIFIED RUNOFF COEFFICIENT

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STUDY NAME: CITY OF SANTEE --- BASIN E

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100.0-YEAR STORM RATIONAL METHOD STUDY

ADVANCED ENGINEERING SOFTWARE

CONCENTRATION AREA (ACRES) SOIL DEV. TT TC I C Q (SUB) Q TOTAL (ft) ft/ft FPS. HYDRAULICS AND NOTES

POINT NUMBER SUBAREA TOTAL TYPE MIN. MIN.

FLOW TO PT.#

40.ft-STREET 3.00 15.7 20.7 4 5

5.00 10.4 31.1 4 5

10.00 12.0 43.1 4 5

15.00 5.0 48.1 4 5

17.00 4.0

40.ft-STREET FLOW TO PT.# 20.00 12.0 16.0 4 5

25.00 9.0 25.0 4 5

30.00 3.0

..

2.00 ..

1.7 ..

1.3 ..

.9 ..

.2 ..

.15.1 ..

2.2 ..

1.4 ..

1.87 ..

.. 11.2 ..

7.6 ..

700 ..

1000 ..

600 ..

200 ..

600 ..

600 ..

700 ..

700 ..

700 ..

700 ..

700 ..

ASSUMED DATA

*Qav= 18.8 cfs

DEPTH=.52 ft.

FLOODWIDTH= 5.2

n=.0130 Dn= 1.4

24.0"-PIPE

*Qav= 30.0 cfs

n=.0130 Dn= 1.8

30.0"-PIPE

*Qav= 44.5 cfs

n=.0130 Dn= 1.7

27.0"-PIPE

*Qav= 60.7 cfs

n=.0130 Dn= 1.7

27.0"-PIPE

ASSUMED DATA

*Qav= 17.6 cfs

DEPTH=.39 ft.

FLOODWIDTH=13.4

*Qav= 35.0 cfs

DEPTH=.65 ft.

FLOODWIDTH= 6.5

ASSUMED DATA

*Qav= 42.2

DEPTH=.65 ft.

FLOODWIDTH= 6.5

ASSUMED DATA

6.7 ..

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SOIL TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,

4=Mobile Home, 5=Single Family, 6=Rural Lots

*DEVELOPMENT TYPES: 1=A, 2=B, 3=C, 4=D, *

0, 5=SPECIFIED RUNOFF COEFFICIENT*

* =

STUDY NAME: CITY OF SANTEE --- BASIN E

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100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	ADVANCED			ENGINEERING			SOFTWARE		
		SOIL DEV. TOTAL	TOTAL SUBAREA	TC TYPE	I MIN.	C MIN.	Q (SUB)	PATH SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
35.00	33.5	36.5	4	5	1.1	12.3	3.83	.550	70.8	77.5
40.00	23.8	60.3	4	5	1.3	13.6	3.59	.550	46.9	124.4
45.00	2.6	62.9	4	5	.8	14.4	3.46	.550	4.9	129.4
45.00	62.9						14.4			129.4

STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 * 0,5=SPECIFIED RUNOFF COEFFICIENT*

*Qav= 6.7 cfs
 n=.0130 Dn=.5
 24.0"-PIPE

*Qav= 77.5 cfs
 n=.0130 Dn= 2.0
 33.0"-PIPE

*Qav= 124.4 cfs
 n=.0130 Dn= 2.7
 42.0"-PIPE

STUDY NAME: CITY OF Santee --- BASIN F

CALCULATED BY: NDB

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100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	TOTAL	ENGINEERING			SOFTWARE			HYDRAULICS AND NOTES
				Tc in/h	C (SUB)	Q TOTAL	PATH	SLOPE	V (ft/ft FPS.)	
2.00	7.7									
30. ft-STREET FLOW TO PT.#	18.9	26.6	4	5	3.7	25.1	2.33	.550	24.2	
5.00										
7.00	6.9				24.9					
30. ft-STREET FLOW TO PT.#	10.00	8.1	15.1	4	5	27.0	2.22	.550	9.9	
10.00										
15.00	11.6	26.7	4	5	.6	27.6	2.19	.550	14.0	
20.00	14.1	40.8	4	5	1.7	29.3	2.10	.550	16.3	
20.00		40.8			29.3				49.2	

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Unit6,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN G

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	Tc MIN.	I TOTAL	C TYPE	Q MIN.	S O F T W A R E]			HYDRAULICS AND NOTES
							Tt MIN.	I TYPE	C MIN.	
2.00	12.8	12.8	4	6	..	12.3	3.98	.450	22.9	22.9
3.00	57.0	69.8	4	6	3.1	15.4	3.44	.450	88.2	111.1
5.00	88.2	158.0	4	6	2.1	17.6	3.16	.450	125.6	236.7
10.00	108.4	266.4	4	6	2.3	19.9	2.92	.450	142.7	379.3
15.00	30.1	296.5	4	5	.6	20.4	2.87	.550	47.5	426.8
20.00	79.5	376.0	4	5	.7	21.2	2.80	.550	122.6	549.4
25.00	7.6	383.6	4	5	.2	21.4	2.78	.550	11.6	561.1
30.00	43.8	427.4	4	5	1.9	23.3	2.63	.550	63.4	624.5

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0,5=SPECIFIED RUNOFF COEFFICIENT*

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STUDY NAME: CITY OF SANTEE ---- BASIN G

100.0-YEAR STORM RATIONAL METHOD STUDY

ADVANCED ENGINEERING SOFTWARE										HYDRAULICS AND NOTES	
CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV. SUBAREA	TC TOTAL	T MIN.	C TYPE	Q (SUB)	PATH SLOPE TOTAL (ft) ft/ft FPS.	V Q TOTAL			
35.00	23.1	450.5	4	5	---	23.5	2.62	.550	33.4	657.9	-----
40.00	29.8	480.3	4	3	---	1.1	-----	-----	1200	.0133	19.0
40.00	480.3	4	3	---	24.6	2.55	.700	53.2	711.0	-----	-----
40.00	480.3	4	3	---	24.6	2.55	.700	53.2	711.0	-----	-----
STREAM SUMMARY										*Qav= 657.9cf/s n=.0130 Dn= 2.2 B= 16.0 Z= .0	

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*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN H

100 · 0-YEAR STORM RATIONAL METHOD STUDY

* * * DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
, 5=SPECIFIED RUNOFF COEFFICIENT

STUDY NAME: CITY OF SANTEE ---- BASIN I

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	ENGINEERING			SOFTWARE			HYDRAULICS AND NOTES
			Tc TOTAL	I TYPE	C MIN.	Tt TOTAL	SLOPE	V ft/ft FPS.	
2.00	7.0	4	6	..	12.8	3.74	.450	11.8	11.8
5.00	2.0	9.0	4	5	1.9	14.7	3.42	.550	3.7
10.00	31.5	40.5	4	5	5.3	20.0	2.80	.550	48.5
12.00	5.0	5.0	4	6	..	12.2	3.86	.450	8.7
15.00	8.0	13.0	4	6	1.8	14.0	3.53	.450	12.7
20.00	25.0	38.0	4	6	1.8	15.8	3.27	.450	36.7
25.00	17.5	55.5	4	6	.7	16.5	3.17	.450	24.9
30.00	61.1	116.5	4	5	4.7	21.2	2.70	.550	90.8
30.00		116.5							173.8
									173.8

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots
* 0.5=SPECIFIED RUNOFF COEFFICIENT*

SOIL TYPES:

1=A, 2=B, 3=C, 4=D,

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STUDY NAME: CITY OF SANTEE --- BASIN J

CALCULATED BY: NDB

100.0-YEAR STORM RATIONAL METHOD STUDY										[A D V A N C E D] E N G I N E E R I N G S O F T W A R E]									
C O N C E N T R A T I O N | A R E A (A C R E S)		S O I L D E V . | T T		T C | Q		I | Q		P A T H | S L O P E V		H Y D R A U L I C S		A N D N O T E S		P A T H | F T / F T E P S .		I N I T I A L S U B A R E A			
P O I N T N U M B E R	S U B A R E A	T O T A L	T Y P E	M I N .	T Y P E	M I N .	T Y P E	M I N .	T Y P E	M I N .	T Y P E	M I N .	T Y P E	M I N .	F T	F T			
2.00																			
2.00	5.0	5.0	4	6	..	11.8	3.94	.450	8.9	8.9	..	700	.3714	..					
3.00	30.0	35.0	4	6	3.1	14.9	3.39	.450	45.8	54.7	..	1150	.1304	6.2	*Qav= 8.9 cfs				
10.00	46.7	81.7	4	6	2.4	17.3	3.08	.450	64.8	119.4	..	1350	.0630	9.4	*Qav= 54.7 cfs				
15.00	27.6	109.3	4	5	1.1	18.4	2.96	.550	44.9	164.3	..	1250	.0320	19.0	*Qav= 119.4 cfs				
20.00	46.0	155.3	4	5	1.6	20.0	2.80	.550	71.0	235.2	..	1800	.0250	18.6	*Qav= 164.3 cfs				
25.00	49.9	205.2	4	5	.3	20.2	2.78	.550	76.3	311.5	..								
30.00	13.0	13.0	4	5	..	12.4	3.82	.550	27.3	27.3	..	800	.2331	..					
35.00	25.8	38.8	4	5	2.0	14.4	3.46	.550	49.2	76.5	..	1000	.0290	8.1	*Qav= 76.5 cfs				

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0, 5=SPECIFIED RUNOFF COEFFICIENT*

0,5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN J

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL SUBAREA	[A D V A N C E D]			E N G I N E E R I N G			S O F T W A R E]		
			Tt	Tc	Tc	I	C	Q (SUB)	Q TOTAL (ft)	PATH SLOPE V ft/ft FPS.	HYDRAULICS AND NOTES
			MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	MIN.	
40.00	9.6	48.4	4	5	5	16.4	3.18	.550	16.9	93.3	
45.00	6.0	54.4	4	1	1	.9	17.4	3.07	.950	17.5	110.8
45.00		54.4					17.4			110.8	

STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 * 5=SPECIFIED RUNOFF COEFFICIENT*

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* Qav= 93.3 cfs
 n=.0300 Dn= 2.3
 B=.0 Z= 2.0

STUDY NAME: CITY OF SANTEE --- BASIN K

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100-0-YEAR STORM RATIONAL METHOD STUDY																		
[A D V A N C E D]		E N G I N E E R I N G S O F T W A R E]																
C O N C E N T R A T I O N A R E A (A C R E S) S O I L D E V . T T		E N G I N E E R I N G Q P A T H S L O P E V		H Y D R A U L I C S		A N D N O T E S												
C O N C E N T R A T I O N P O I N T N U M B E R	A R E A (A C R E S)	S O I L T Y P E	D E V .	T T	Q (S U B)	P A T H S L O P E T O T A L (f t)	V f t / f t F P S .											
MIN.	M I N .	T Y P E	M I N .	M I N .	I N / h	F T	F P S .											
CONFLUENCE	TC#1= 22.9	TC#2= 18.7	TC#3= .0	TC#4= .0	TC#5= .0	LARGEST												
ANALYSIS	Q#1= 514.8	Q#2= 207.6	Q#3= .0	Q#4= .0	Q#5= .0	CONFLUENCE												
FOR POINT#	I#1= 2.76	I#2= 3.15	I#3= .00	I#4= .00	I#5= .00	Q= 696.8												
5.00	Q1 = 696.8	Q2 = 658.9	Q3 = .0	Q4 = .0	Q5 = .0													
10.00	56.0	574.5	4	5	1.0	23.9	2.69	550	82.8	779.6								
15.00	146.5	721.0	4	3	1.1	25.1	2.61	700	267.5	1047.1								
20.00	97.1	818.1	4	5	.5	25.6	2.57	550	137.4	1184.5								
30.00	56.5	874.6	4	5	.8	26.4	2.52	550	78.3	1262.9								
35.00	41.0	915.6	4	5	1.3	27.8	2.44	550	55.1	1317.9								
CONFLUENCE	TC#1= 27.8	TC#2= .0	TC#3= .0	TC#4= .0	TC#5= .0	LARGEST												
ANALYSIS	Q#1=1317.9	Q#2= .0	Q#3= .0	Q#4= .0	Q#5= .0	CONFLUENCE												
FOR POINT#	I#1= 2.44	I#2= .00	I#3= .00	I#4= .00	I#5= .00	Q= 1317.9												
35.00	Q1 = 1317.9	Q2 = .0	Q3 = .0	Q4 = .0	Q5 = .0													

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

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STUDY NAME: CITY OF SANTEE --- BASIN K

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	TOTAL	ENGINEERING			SOFTWARE		
				TYPE	MIN.	TC I C (in/h)	Q (SUB)	PATH SLOPE V TOTAL (ft) ft/ft|fps.	HYDRAULICS AND NOTES
35.00	205.2			..	20.2			311.5	
CONFLUENCE ANALYSIS FOR POINT#	TC#1= 27.8 . TC#2= 20.2 Q#1=1317.9 Q#2= 311.5 I#1= 2.44 I#2= 2.99 35.00 Q1 =1572.1 Q2 =1386.8			TC#3= .0 Q#3= .0 I#3= .00 Q3 = .0	TC#4= .0 Q#4= .0 I#4= .00 Q4 = .0	TC#5= .0 Q#5= .0 I#5= .00 Q5 = .0			LARGEST CONFLUENCE Q=1572.1
36.00	25.0 1145.7	4	5	..	.4	28.2 2.42	.550	33.3 1605.4	*Qav=1572.1 cfs n=.0150 Dn= 3.6 B= 14.0 Z= 1.5
36.00	25.0 1145.7			..		28.2 2.42		1605.4	FOR CONFLUENCE
36.00	36.00	1145.7		..					ASSUMED DATA
36.00	36.00	54.4	54.4	..	17.4			110.8	
CONFLUENCE ANALYSIS FOR POINT#	TC#1= 28.2 TC#2= 17.4 Q#1=1605.4 Q#2= 110.8 I#1= 2.42 I#2= 3.30 36.00 Q1 =1686.5 Q2 =1286.4			TC#3= .0 Q#3= .0 I#3= .00 Q3 = .0	TC#4= .0 Q#4= .0 I#4= .00 Q4 = .0	TC#5= .0 Q#5= .0 I#5= .00 Q5 = .0			LARGEST CONFLUENCE Q=1686.5
40.00	40.00	25.0 1225.2	4	5	.4	28.6 2.40	.550	33.0 1719.5	*Qav=1686.5 cfs n=.0150 Dn= 3.9 B= 14.0 Z= 1.5
45.00	45.00	37.6 1262.8	4	6	1.1	29.7 2.34	.450	39.5 1759.0	*Qav=1719.5 cfs n=.0300 Dn= 5.8 B= 10.0 Z= 2.0
								1700 .0094 11.3	*Qav=1759.0 cfs n=.0300 Dn= 5.1 B= 20.0 Z= 2.0
									SOIL TYPES: 1=A, 2=B, 3=C, 4=D, 0,5=SPECIFIED RUNOFF COEFFICIENT*

* DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,

* 4=Mobile Home, 5=Single Family, 6=Rural Lots

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STUDY NAME: CITY OF Santee --- BASIN K

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	ADVANCED			ENGINEERING			SOFTWARE		
		SOIL DEV. TOTAL	T _c TYPE	T _c MIN.	Q in/h (SUB)	Q in/h (TOTAL)	V ft/ft (ft)	SLOPE FPS.	HYDRAULICS AND NOTES	
50.00	41.0	1303.8	4	6	32.2	2.22	.450	40.9	1800.0	
50.00		1303.8			32.2				1800.0	

STREAM SUMMARY

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* DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0, 5=SPECIFIED RUNOFF COEFFICIENT

STUDY NAME: CITY OF SANTEE ---- BASIN L

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION	AREA (ACRES)	A D V A N C E D SOIL DEV.	E N G I N E E R I N G TOTAL	S O F T W A R E	C O M P U T E R PATH	SLOPE	V	HYDRAULICS AND NOTES
POINT NUMBER	SUBAREA	TOTAL	TYPE	MIN.	MIN. IN/h	(SUB)	TOTAL (ft)	ft/ft FPS.
2.00	5.8	5.8	4	6	..	13.4	3.77	.450
30 ft-STREET FLOW TO PT.# 3.00	22.9	28.7	4	5	..	16.8	3.25	.550
30 ft-STREET FLOW TO PT.# 10.00	25.7	54.4	4	5	2.8	19.6	2.95	.550
10.00	54.4	..	..	..	..	19.6	2.95	..
5.00	6.2	..	..	..	..	16.7	..	..
30 ft-STREET FLOW TO PT.# 6.00	9.9	16.1	4	5	2.2	18.9	3.02	.550
7.00	11.7	27.8	4	5	..	19.8	2.93	.550
CONFERENCE ANALYSIS FOR POINT# 10.00	Q1 = 137.4	Q2 = 135.8	Q3 =	.0

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INITIAL SUBAREA
*Qav= 30.5 cfs	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
DEPTH=.44 ft.								
FLOODWIDTH=15.0								
*Qav= 71.7 cfs	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
DEPTH=.57 ft.								
FLOODWIDTH=15.0								
FOR CONFLUENCE								
ASSUMED DATA								
*Qav= 19.4 cfs	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
DEPTH=.40 ft.								
FLOODWIDTH=13.7								
*Qav= 27.7 cfs	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
n=.0130 Dn= 1.3								
24.0"-PIPE								
*Qav= 46.5 cfs	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
n=.0130 Dn= 1.6								
30.0"-PIPE								
LARGEST CONFLUENCE								
Q= 137.4								

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural LotsSOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN M

1100 0-YEAR STOCHASTIC BATIONAL METHOD STUDY

FOR CONFLUENCE									
INITIAL SUBARE									
20.00		67.8			18.8	3.03		119.5	
16.00	15.7	15.7	4	6	..	16.2	3.33	450	23.5
26. ft-STREET FLOW TO PT.#					.7	16.9	3.24	550	18.0
17.00	10.1	25.8	4	5					
18.00	9.7	35.5	4	5	1.6	18.5	3.06	550	16.4
CONFLUENCE ANALYSIS FOR POINT# 20.00	TC#1= 18.8 Q#1= 119.5 I#1= 3.03 Q1 = 173.5	TC#2= 21.0 Q#2= 57.9 I#2= 2.82 Q2 = 169.2	TC#3= .0 Q#3= .0 I#3= .00 Q3 = .0	TC#4= .0 Q#4= .0 I#4= .00 Q4 = .0	TC#5= .0 Q#5= .0 I#5= .00 Q5 = .0	LARGEST CONFLUENCE Q = 173.5			

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
, 5=SPECIFIED RUNOFF COEFFICIENT

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASTIN M

אדריכלות כונסנס ומודרניזם בבריטניה

100-0-YEAR STORM RATIONAL METHOD STUDY						ENGINEERING SOFTWARE					
CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SOIL TOTAL	DEV. TYPE	TC MIN.	TC MIN.	C SUB)	Q TOTAL	PATH SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES	
25.00	6.8 110.2	4	5	.5	19.3	2.98	.550	11.1	184.6	400	*Qav= 173.5 cfs n=.0130 Dn= 3.4 51.0"-PIPE
25.00	110.2				19.3	2.98					FOR CONFLUENCE
22.00	10.2	4	6		12.3	3.98	.450	18.3		860 .2779 ..	INITIAL SUBAREA
22.00										1330 .0376 12.8	*Qav= 18.3 cfs

24.0"-PIPE									
24.0"-PIPE									
25.00	16.8	27.0	4	5	1.7	14.1	3.65	.550	33.6
CONFLUENCE	TC#1 = 19.3	TC#2 = 14.1	TC#3 =	.0	TC#4 =	.0	TC#5 =	.0	LARGEST CONFLUENCE
ANALYSIS	Q#1 = 184.6	Q#2 = 51.9	Q#3 =	.0	Q#4 =	.0	Q#5 =	.0	Q = 226.9
FOR POINT #	I#1 = 2.98	I#2 = 3.65	I#3 =	.00	I#4 =	.00	I#5 =	.00	
	25.00	Q1 = 226.9	Q2 = 202.4	Q3 =	.0	Q4 =	.0	Q5 =	
									*Qave = 226.9 cft
									n = .0130 Dn = 4.
									72.0"-PIPE
30.00	32.5	169.6	4	5	1.5	20.8	2.84	.550	50.8
									277.7
									277.7
									STREAM SUMMARY
30.00	30.00	169.6				20.8			

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

STUDY NAME: CITY OF SANTER --- BASTIN N

SULLIVAN, MELISSA C. / SULLIVAN, MELISSA C.

*QAv= 93.3CFB
n=.0130 Dn= 2.2
33.0"-PIPE
STREAM SUMMARY

DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lot

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
*, 5=SPECIFIED RUNOFF COEFFICIENT

STUDY NAME: CITY OF SANTEE --- BASIN O

100 0-YEAR STORM RATIONAL METHOD STUDY

100-YEAR STORM NATIONAL FLOOD PLAIN										SOFTWARE			
ADVANCED ENGINEERING				ENGINEERING				HYDRAULICS AND NOTES					
CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV. TOTAL	TC TYPE	I MIN.	C MIN.	Q (SUB)	Q TOTAL (ft)	SLOPE V FT/FT	FPS.				
5.00	9.9	9.9	4	6	..	12.2	3.99	.450	17.7	17.7	1000	.4140	..
10.00	44.3	54.2	4	6	2.7	14.9	3.51	.450	70.0	87.7	1450	.1172	8.9
30. ft-STREET		FLOW TO PT.#		1.8	16.7	3.27	.550	25.9	113.6	1100	.0500	11.0	*Qav= 100.7 cfs DEPTH=.59 ft.
11.00	14.4	68.6	4	5	..	..	..	..	..	850	.0388	20.0	FLOODWIDTH=15 .
15.00	13.5	82.1	4	5	.7	17.4	3.18	.550	23.6	137.2	350	.0143	14.5 *Qav= 113.6 cfs n=.0130 Dn= 2 .
20.00	17.0	99.0	4	5	.4	17.8	3.13	.550	29.2	166.4	..	..	*Qav= 137.2 cfs n=.0130 Dn= 2 .
20.00	99.0	..	..	..	..	17.8	3.13	..	..	166.4	..	..	48.0"-PIPE
17.00	10.3	10.3	4	6	..	11.7	4.11	.450	19.0	19.0	700	.4057	..
18.00	64.6	74.9	4	6	3.8	15.5	3.42	.450	99.6	118.6	2200	.1591	9.6
30. ft-STREET		FLOW TO PT.#		..	..	..	..	..	..	..	650	.0538	13.6 *Qav= 141.1 cfs DEPTH=.65 ft.
19.00	24.7	99.6	4	5	.9	16.4	3.30	.550	44.9	163.5	..	..	FLOODWIDTH=15 .

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lot

SOIL TYPES: 1=A, 2=B, 3=C, 4=D, *
, 5=SPECIFIED RUNOFF COEFFICIENT*

+

STUDY NAME: CITY OF SANTEE --- BASIN O

100.0-YEAR STORM RATIONAL METHOD STUDY

[ADVANCED ENGINEERING SOFTWARE]

POINT NUMBER	CONCENTRATION AREA (ACRES)	POINT SUBAREA	DEV.	SOIL TYPE	MIN. TYPE	MIN. MIN.	TC I C Q	SLOPE Q	TOTAL PATH (ft)	V ft/ft FPS.	HYDRAULICS AND NOTES
20.00	35.8	135.5	4	5	---	.4	16.9	3.25	.550	64.0	227.5
CONFERENCE CONFLUENCE ANALYSIS FOR POINT#	TC#1= 17.8 Q#1= 166.4 I#1= 3.13 20.00 Q1 = 385.9	TC#2= 16.9 Q#2= 227.5 I#2= 3.25 Q2 = 388.0	TC#3= .0 Q#3= .0 I#3= .00 Q3 = .0	TC#4= .0 Q#4= .0 I#4= .00 Q4 = .0	TC#5= .0 Q#5= .0 I#5= .00 Q5 = .0	TC#6= .0 Q#6= .0 I#6= .00 Q6 = .0	TC#7= .0 Q#7= .0 I#7= .00 Q7 = .0	TC#8= .0 Q#8= .0 I#8= .00 Q8 = .0	TC#9= .0 Q#9= .0 I#9= .00 Q9 = .0	TC#10= .0 Q#10= .0 I#10= .00 Q10 = .0	LARGEST CONFLUENCE Q= 388.0
25.00	234.5	---	---	---	---	1.5	18.4	3.08	388.0	388.0	FOR CONFLUENCE
22.00	5.8	5.8	4	6	---	12.2	3.99	.450	10.4	10.4	INITIAL SUBAREA
25.00	14.0	19.8	4	5	---	1.0	13.2	.80	.550	.550	INITIAL SUBAREA
CONFERENCE CONFLUENCE ANALYSIS FOR POINT#	TC#1= 18.4 Q#1= 388.0 I#1= 3.08 25.00 Q1 = 420.1	TC#2= 13.2 Q#2= 39.7 I#2= 3.80 Q2 = 353.5	TC#3= .0 Q#3= .0 I#3= .00 Q3 = .0	TC#4= .0 Q#4= .0 I#4= .00 Q4 = .0	TC#5= .0 Q#5= .0 I#5= .00 Q5 = .0	TC#6= .0 Q#6= .0 I#6= .00 Q6 = .0	TC#7= .0 Q#7= .0 I#7= .00 Q7 = .0	TC#8= .0 Q#8= .0 I#8= .00 Q8 = .0	TC#9= .0 Q#9= .0 I#9= .00 Q9 = .0	TC#10= .0 Q#10= .0 I#10= .00 Q10 = .0	LARGEST CONFLUENCE Q= 420.1
30.00	254.3	---	---	---	---	.3	18.6	3.05	420.1	420.1	FOR CONFLUENCE

* DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 * 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 * 0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN O

EVALUATION OF A NEW SPUTTERING METHOD FOR STUDY

GOVERNMENT SERVICE

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*DEVELOPMENT TYPES:
1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

0,5=SPECIFIED RUNOFF COEFFICIENT*

U.S.-SPECIFIED RANGES IN COUNTRIES

STUDY NAME: CITY OF SANTEE --- BASIN P

CALCULATED BY: NDB

CHECKED BY:

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100-0-YEAR STORM RATIONAL METHOD STUDY

[A D V A N C E D E N G I N E E R I N G S O F T W A R E]

CONCENTRATION | AREA (ACRES) | SOIL DEV. | TT | TC | Q | PATH SLOPE | V | HYDRAULICS

POINT NUMBER | SUBAREA | TOTAL | TYPE | MIN. | MAX. | in/h | (SUB) | TOTAL (ft) | ft/ft | FPS. | AND NOTES

POINT NUMBER	SUBAREA	TOTAL	TYPE	MIN.	MAX.	in/h	(SUB)	TOTAL (ft)	ft/ft	FPS.	
2.00	2.6	2.6	4	6	..	11.8	4.09	.450	4.7	500	1.800 .. INITIAL SUBAREA
5.00	96.1	98.7	4	6	11.9	23.7	2.61	.450	112.8	117.6	*Qav= 4.7 cfs n=.0400 Dn=.2 B=.50 Z=.20
10.00	8.2	106.9	4	1	..	24.5	2.55	.950	19.9	137.5	*Qav= 117.6 cfs n=.0130 Dn=2.3 36.0"-PIPE
15.00	69.0	176.0	4	2	..	25.8	2.47	.850	144.8	282.2	*Qav= 137.5 cfs n=.0130 Dn=2.7 45.0"-PIPE
25.00	18.0	194.0	4	2	..	26.4	2.43	.850	37.2	319.4	*Qav= 282.2 cfs n=.0130 Dn=4.2 66.0"-PIPE
25.00	194.0	194.0	..	..	..	26.4	2.43	..	319.4	..	FOR CONFLUENCE
17.00	5.7	5.7	4	6	..	12.3	3.98	.450	10.2	10.2	930 .3333 .. INITIAL SUBAREA
18.00	17.9	23.6	4	6	1.2	13.5	3.76	.450	30.3	40.5	*Qav= 10.2 cfs n=.0350 Dn=.9 B=.0 Z=.20
											*Qav= 40.5 cfs n=.0130 Dn=1.4 24.0"-PIPE

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 *4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0.5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE ---- BASIN P

100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	Tt	TC	I	C	Q	PATH	SLOPE	V	HYDRAULICS AND NOTES
POINT NUMBER	SUBAREA	TOTAL	TYPE	TYPE	MIN.	MIN.	in/h	(SUB)	TOTAL (ft)	ft/ft	EPS.
60.ft-STREET											
FLOW TO PT.#											
20.00	17.4	41.0	4	5	4.7	18.4	3.07	.550	29.3	69.7	
25.00	20.0	61.0	4	2	2.3	20.7	2.85	.850	48.4	118.1	
CONFLUENCE	TC#1= 26.4	TC#2= 20.7	TC#3=	.0	TC#4=	.0	TC#5=	.0			LARGEST CONFLUENCE
ANALYSIS	Q#1= 319.4	Q#2= 118.1	Q#3=	.0	Q#4=	.0	Q#5=	.0			Q= 420.3
FOR POINT#	I#1= 2.43	I#2= 2.85	I#3=	.00	I#4=	.00	I#5=	.00			
	25.00 Q1 = 420.3	Q2 = 390.8	Q3 =	.0	Q4 =	.0	Q5 =	.0			
30.00	43.2	298.1	4	5	1.0	27.5	2.37	.550	56.3	476.6	
35.00	24.7	322.8	4	5	1.7	29.2	2.28	.550	31.0	507.6	
40.00	13.7	336.5	4	5	1.6	30.7	2.21	.550	16.6	524.1	
40.00		336.5				30.7			524.1		STREAM SUMMARY

CALCULATED BY: NDB

CHECKED BY:

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STUDY	A	D	E	D	E	C	Q	PATH	SLOPE	V	HYDRAULICS AND NOTES
POINT NUMBER	AREA (ACRES)	SOIL	DEV.	Tt	TC	I	C	(SUB)	TOTAL (ft)	ft/ft	EPS.
60.ft-STREET											
FLOW TO PT.#											
20.00	17.4	41.0	4	5	4.7	18.4	3.07	.550	29.3	69.7	*Qav= 55.0 cfs n=.0130 Dn= 2.8 45.0"-PIPE
25.00	20.0	61.0	4	2	2.3	20.7	2.85	.850	48.4	118.1	
CONFLUENCE	TC#1= 26.4	TC#2= 20.7	TC#3=	.0	TC#4=	.0	TC#5=	.0			
ANALYSIS	Q#1= 319.4	Q#2= 118.1	Q#3=	.0	Q#4=	.0	Q#5=	.0			
FOR POINT#	I#1= 2.43	I#2= 2.85	I#3=	.00	I#4=	.00	I#5=	.00			
	25.00 Q1 = 420.3	Q2 = 390.8	Q3 =	.0	Q4 =	.0	Q5 =	.0			
30.00	43.2	298.1	4	5	1.0	27.5	2.37	.550	56.3	476.6	
35.00	24.7	322.8	4	5	1.7	29.2	2.28	.550	31.0	507.6	
40.00	13.7	336.5	4	5	1.6	30.7	2.21	.550	16.6	524.1	
40.00		336.5				30.7			524.1		STREAM SUMMARY

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
* DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots
* 0,5=SPECIFIED RUNOFF COEFFICIENT* Qav= 69.7 cfs
n=.0130 Dn= 2.8
45.0"-PIPE

STUDY NAME: CITY OF SANTEE --- BASIN Q

100:0-YEAR STORM RATIONAL METHOD STUDY

PROJECT NAME: NATIONAL PARKS								PAGE NUMBER 37 OF 53			
ADVANCED ENGINEERING SOFTWARE											
CONCENTRATION POINT NUMBER	AREA SUBAREA	(ACRES)	SOIL TYPE	TT TOTAL	TC TYPE	I MIN.	C MIN.	Q (SUB)	Q TOTAL	V FT/FT FPS.	HYDRAULICS AND NOTES
2.00	9.5	9.5				5.6		57.8			ASSUMED DATA
5.00	22.0	31.5	4	1	1.1	6.6	5.71	.950	119.4	177.2	*Qav= 57.8 cfs n=.0130 Dn= 2.1 33.0"-PIPE
10.00	27.4	58.9	4	1	8.0	5.07	.950	132.1	309.3	1350 .0037 10.6	*Qav= 177.2 cfs n=.0130 Dn= 3.4 54.0"-PIPE
15.00	26.9	85.8	4	3	2.1	10.1	4.36	.700	82.1	391.4	*Qav= 309.3 cfs n=.0130 Dn= 5.1 81.0"-PIPE
20.00	28.2	114.0	4	1	.8	10.9	4.15	.950	111.2	502.7	*Qav= 391.4 cfs n=.0130 Dn= 4.7 75.0"-PIPE
25.00	11.5	125.5	4	2	.1	10.9	4.13	.850	40.3	542.9	*Qav= 502.7 cfs n=.0130 Dn= 3.9 63.0"-PIPE
25.00		125.5				10.9	4.13			542.9	FOR CONFLUENCE
22.00		11.4				..	24.5			19.6	ASSUMED DATA
23.00	7.9	19.3	4	1	2.7	27.2	2.30	.950	17.2	36.8	*Qav= 19.6 cfs n=.0130 Dn= 2.0 30.0"-PIPE
										690 .0058 7.3	33.0"-PIPE
										1.6	

DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots
0.5=SPECIFIED RUNOFF COEFFICIENT*

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,*

* DEVELOPMENT TYPES: 1=INDUSTRIAL, 2=COMMERCIAL, 3=MULTI-UNITS,
 4=Mobile Home, 5=Single Family, 6=Rural Lots

STUDY NAME: CITY OF SANTEE --- BASIN Q

CALCULATED BY: NDB

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100.0-YEAR STORM RATIONAL METHOD STUDY

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CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	TC	I	C	Q (SUB)	TOTAL	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES		
											MIN.	in/h	
24.00	7.9	27.2	4	2	---	28.8	2.22	.850	14.9	51.7	650	.0046	
25.00	20.3	47.5	4	5	1.5	30.3	2.14	.550	23.9	75.6	---	---	
CONFLUENCE ANALYSIS FOR POINT#	TC#1= 10.9 Q#1= 542.9 I#1= 4.13 Q1 = 582.1	TC#2= 30.3 Q#2= 75.6 I#2= 2.14 Q2 = 357.4	TC#3= .0 Q#3= .0 I#3= .00 Q3 = .04	TC#4= .0 Q#4= .0 I#4= .00 I#5= .05	TC#5= .0 Q#5= .0 I#5= .0	1350	.0022	21.6	*Qav= 582.1 cfs n=.0150 Dn= 4.5 B= 6.0 Z= .0	LARGEST CONFLUENCE Q= 582.1	---	---	
30.00	17.3	190.2	4	3	1.0	12.0	3.90	.700	47.2	629.3	---	---	
27.00	28.00	8.6	14.3	1	1.4	6.9	5.55	.950	45.5	80.3	400	.0075	
30.ft-STREET FLOW TO PT.#	28.00	8.6	14.3	4	1	2.5	4.54	.700	50.9	131.3	940	.0021	
29.00	16.0	30.4	4	3	9.5	4.54	7.00	50.9	131.3	---	---	---	
32.00	9.8	---	---	..	38.8	---	---	9.8	1300	.0092	4.4	*Qav= 23.7 cfs DEPTH= .49 ft. FLOODWIDTH=15.0	
30.ft-STREET FLOW TO PT.#	35.00	19.9	29.7	4	2	6.2	45.0	1.66	.850	28.0	37.9	---	---

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural LotsSOIL TYPES: 1=A, 2=B, 3=C, 4=D,
5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN Q

CALCULATED BY : NDB

100-YEAR STORM RATIONAL METHOD STUDY

PAGE NUMBER 39 OF 53

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0,5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN R

| CALCULATED BY: NDB

**100.0-YEAR STORM RATIONAL METHOD STUDY
[A D V A N C E D
CONCENTRATION AREA (ACRES) | SOCN | DEV |**

PAGE NUMBER 41 OF 53

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D, *
 0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN S

CALCULATED BY: NDB
CHECKED BY:

100.0-YEAR STORM RATIONAL METHOD STUDY

PAGE NUMBER 42 OF 53

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	TOTAL	TYPE	TYPE	MIN.	MIN.	in/h	(SUB)	Q	TOTAL	ft	PATH	SLOPE	V	HYDRAULICS	AND NOTES			
5.00			9.0			..	19.4				21.8		670	.0090	3.8	*Qav= 25.1cfs		ASSUMED DATA		
30. ft-STREET						3.0					22.4	2.60	.850	6.6	28.4	1000	.0030	3.4	*Qav= 38.7cfs	
FLOW TO PT.#	10.00	3.0	12.0	4	2													DEPTH=.67 ft.	FLOODWIDTH=15.0	
30. ft-STREET						5.2					27.6	2.27	.850	20.5	48.9	1530	.0052	7.7	*Qav= 48.9cfs	
FLOW TO PT.#	15.00	10.6	22.6	4	2													n=.0130 Dn= 2.3	39.0"-PIPE	
						3.3					31.0	2.11	.850	19.6	68.5			ASSUMED DATA		
20.00		10.9	33.5	4	2															
25.00			8.0			..	14.7													
30.00		9.0	17.0	4	2	..	15.5	3.31	.850	25.2	47.5									
35.00		43.2	60.2	4	2	5.5	20.9	2.72	.850	99.9	147.4									
40.00			4.1			..	29.2													
45.00		28.0	32.0	4	2	8.0		37.2	1.88	.850	44.6	49.6								

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN T

CALCULATED BY: NDB

100-YEAR STORM RATIONAL METHOD STUDY

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SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0,5=SPECIFIED RUNOFF COEFFICIENT

***DEVELOPMENT TYPES:** 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots*

STUDY NAME: CITY OF SAVANNAH -- BASIN U

CALCULATED BY: NDB

CHECKED BY:

100.0-YEAR STORM RATIONAL METHOD STUDY

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CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	TOTAL TYPE	TC MIN.	I in/h	C (SUB)	Q TOTAL	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
2.00	4.7					10.4				ASSUMED DATA
3.00	10.1	14.8	4	5	1.8	10.6				*Qav= 10.4 cfs n=.0400 Dn=.2 B= 10.0 Z= 2.0
5.00	17.5	32.3	4	5	1.0	12.4	3.66	.550	20.3	850 .0365 14.3 n=.0130 Dn= 1.3 24.0"-PIPE
10.00	25.5	57.8	4	5	1.3	13.4	3.48	.550	33.6	870 .0115 10.9 n=.0130 Dn= 2.3 36.0"-PIPE
15.00					.8	14.8	3.28	.550	46.0	700 .0186 15.2 n=.0130 Dn= 2.5 42.0"-PIPE
					15.5				110.3	STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN V

CALCULATED BY: NDB

CHECKED BY:

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100.0-YEAR STORM RATIONAL METHOD STUDY

CONCENTRATION (A D V A N C E D) AREA (ACRES) SOIL DEV. TC TC I C Q TOTAL (ft) SLOPE ft/ft V HYDRAULICS

POINT NUMBER

SUBAREA

TOTAL

TYPE

TYPE

MIN.

in/h

(SUB)

TOTAL

(ft)

SLOPE

ft/ft

FPS.

AND NOTES

ASSUMED DATA

FLOW TO PT.#	A	D	V	A	N	C	E	D	E	(V)	(G)	(I)	(C)	(Q)	TOTAL	PATH	SLOPE	V	HYDRAULICS
	(A)	(D)	(V)	(A)	(D)	(V)	(C)	(E)	(D)	(E)	(G)	(I)	(C)	(Q)	(ft)	(ft)	(ft/ft)	(FPS.)	(AND NOTES)
2.00																			
30. ft-STREET																			
3.00	28.0	36.0	4	5	1.2	13.3	3.50	.550	53.9	70.3	2650	.0547	20.5	*Qav= 43.4 cfs DEPTH=.44 ft. FLOODWIDTH=15.0					
5.00	132.7	168.7	4	5	2.2	15.5	3.18	.550	231.9	302.2	900	.0300	23.1	n=.0130 Dn= 3.5 30.0"-PIPE					
10.00	131.1	299.8	4	5	.6	16.1	3.09	.550	223.1	525.3	330	.0091	17.0	*Qav= 525.3 cfs n=.0130 Dn= 5.2 84.0"-PIPE					
15.00	154.8	454.6	4	5	.3	16.5	3.06	.550	260.1	785.5	350	.0143	22.0	*Qav= 785.5 cfs n=.0130 Dn= 5.9 87.0"-PIPE					
20.00	130.7	585.3	4	5	.3	16.7	3.02	.550	217.3	1002.8	2700	.0270	25.9	*Qav=1002.8 cfs n=.0150 Dn= 4.2 B= 1.0 Z= 2.0					
25.00	69.3	654.6	4	5	1.7	18.5	2.84	.550	108.1	1110.9	1550	.0181	22.7	*Qav=1110.9 cfs n=.0150 Dn= 4.9 B= .0 Z= 2.0					
30.00	134.3	788.8	4	5	1.1	19.6	2.73	.550	201.6	1312.5	1780	.0135	22.8	*Qav=1312.5 cfs n=.0150 Dn= 5.0 B= 4.0 Z= 1.5					
35.00	47.2	836.0	4	5	1.3	20.9	2.62	.550	68.0	1380.5									

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN V

CALCULATED BY: NDB
CHECKED BY:

PAGE NUMBER 46 OF 53

100 . 0 -YEAR STORM RATIONAL METHOD STUDY
[A D V A N C E D E N G I N E E R I N G S O F T W A R E]
CONCENTRATION AREA (ACRES) SOIL DEV. TT TC I C Q Q PATH SLOPE V HYDRAULICS
POINT NUMBER SUBAREA TOTAL TYPE TYPE MIN. MIN. in/h (SUB) TOTAL (ft) ft/ft FPS AND NOTES

680 .0118 22.1 *Qav=1380.5cfs
n=.0150 Dn= 5.0
B= 5.0 Z= 1.5

40.00 4.3 840.4 4 5 .5 21.4 2.58 .550 6.1 1386.7 1260 .0103 19.3 *Qav=1386.7cfs
n=.0150 Dn= 6.0
B= .0 Z= 2.0

STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
* 0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN W

CALCULATED BY: NDB

CHECKED BY:

PAGE NUMBER 47 OF 53

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	ADVANCED		ENGINEERING		SOFTWARE		CALCULATED BY: NDB	CHECKED BY: ..	PAGE NUMBER 47 OF 53
		TOTAL	TYPE	TC MIN.	I in/h	C (SUB)	Q TOTAL	PATH SLOPE ft/ft	V FPS.	
2.00	8.2	8.2	4	6	..	12.3	3.69	.450	13.6	13.6
5.00	50.5	58.7	4	6	1.9	14.2	3.36	.450	76.4	90.0
10.00	16.5	75.2	4	5	.3	14.5	3.32	.550	30.1	120.2
15.00	5.7	80.9	4	5	.4	14.9	3.25	.550	10.2	130.4
20.00	3.4	84.3	4	5	.9	15.8	3.13	.550	5.9	136.2
35.00	3.7	3.7	4	6	..	12.8	3.59	.450	6.0	6.0
40.00	15.4	19.1	4	6	2.8	15.6	3.16	.450	21.9	27.9
45.00	16.6	35.7	4	5	5.8	21.4	2.58	.550	23.6	51.5
55.00					..				6.8	
					16.7					ASSUMED DATA

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
 *4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
 0, 5=SPECIFIED RUNOFF COEFFICIENT

STUDY NAME: CITY OF SANTEE --- BASIN W

CALCULATED BY: NDE

CHECKED BY:
PAGE NUMBER 48 OF 53

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots

0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN X

CALCULATED BY: NDB

CHECKED BY:

PAGE NUMBER 49 OF 53

100.0-YEAR STORM RATIONAL METHOD STUDY

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0,5=SPECIFIED RUNOFF COEFFICIENT*

CONCENTRATION

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C
S
AND NOTES

AREA (ACRES)

SOIL
DEV.

TC

I

C

Q

PATH

SLOPE

ft/ft

EPS.

POINT
NUMBER

SUBAREA

TOTAL

TYPE

MIN.

in/h

(SUB)

2.00	10.0	10.0	4	6	..	12.0	3.75	.450	16.9	16.9	400	.0900	..	INITIAL SUBAREA
3.00	95.3	105.3	4	6	9.2	21.1	2.60	.450	111.5	128.3	2900	.0569	5.3	*Qav= 16.9cfs n=.0400 Dn=.5 B= 10.0 Z= 2.0
5.00	441.8	547.1	4	6	8.3	29.4	2.10	.450	417.7	546.0	3850	.0429	7.8	*Qav= 128.3cfs n=.0400 Dn= 1.3 B= 5.0 Z= 2.0
10.00	442.7	989.8	4	6	2.0	31.4	2.01	.450	401.0	947.0	1250	.0280	10.3	*Qav= 546.0cfs n=.0400 Dn= 3.2 B= 10.0 Z= 2.0
15.00	56.0	1045.8	4	5	.8	32.3	1.98	.550	60.9	1007.9	1300	.0308	25.5	*Qav= 947.0cfs n=.0150 Dn= 2.5 B= 10.0 Z= 2.0
20.00	12.7	1058.5	4	5	.2	32.4	1.97	.550	13.6	1021.7	300	.0400	29.8	*Qav=1007.9cfs n=.0130 Dn= 1.8 B= 15.0 Z= 2.0
25.00	25.0	1083.5	4	5	1.2	33.7	1.92	.550	26.5	1048.2	1100	.0073	14.8	*Qav=1021.7cfs n=.0150 Dn= 3.2 B= 15.0 Z= 2.0
25.00					33.7				1048.2					STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0,5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN Y

CALCULATED BY: NDB

CHECKED BY:

100.0-YEAR STORM RATIONAL METHOD STUDY

PAGE NUMBER 50 OF 53

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SOIL DEV. TOTAL	Tt TC I C Q (SUB)	V MIN. MIN./h	S O F T W A R E		HYDRAULICS AND NOTES							
					Q TOTAL	PATH (ft)	FPS.							
2.00	10.0	10.0	4	6	..	12.4	3.66	450	16.5	16.5	600	.1200	..	INITIAL SUBAREA
5.00	136.5	146.5	4	6	8.7	21.1	2.60	.450	159.7	176.2	1100	.1545	14.6	*Qav= 176.2 cfs n=.0400 Dn=.4 B= 5.0 Z= 2.0
10.00	73.8	220.3	4	6	1.3	22.4	2.50	.450	83.2	259.4	1750	.0629	29.5	*Qav= 259.4 cfs n=.0130 Dn= 2.8 45.0"-PIPE
15.00	14.2	234.5	4	5	1.0	23.4	2.44	.550	19.0	278.4	700	.0357	24.2	*Qav= 278.4 cfs n=.0130 Dn= 3.2 51.0"-PIPE
20.00	18.4	252.9	4	4	.5	23.9	2.40	.650	28.8	307.1	550	.0309	23.4	*Qav= 307.1 cfs n=.0130 Dn= 3.5 54.0"-PIPE
25.00	5.9	258.8	4	4	.4	24.2	2.38	.650	9.1	316.3	100	.0800	16.4	*Qav= 316.3 cfs n=.0240 Dn= 3.5 42.0"-PIPE
30.00	12.8	271.6	4	2	.1	24.3	2.37	.850	25.8	342.1	900	.2222	..	INITIAL SUBAREA
32.00	9.1	9.1	4	6	..	12.6	3.62	.450	14.8	14.8				

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
* 0, 5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE --- BASIN Y

CALCULATED BY: NDB
CHECKED BY:

100.0-YEAR STORM RATIONAL METHOD STUDY

PAGE NUMBER 51 OF 53

CONCENTRATION POINT NUMBER	[A D V A N C E D] AREA (ACRES)	SUBAREA	TOTAL	TYPE	TC	I	C	Q	Q	PATH	SLOPE	V	HYDRAULICS AND NOTES
					MIN.	MIN.	in/h	(SUB)	TOTAL	(ft)	ft/ft	FPS.	
30. ft-STREET FLOW TO PT.# 35.00	7.0	16.1	4	5	2.5	15.1	.323	.550	12.4	27.3			*Qav= 21.0cfs DEPTH=.37 ft. FLOODWIDTH=12.0
37.00	5.0	5.0	4	6	..	11.2	3.91	.450	8.8	8.8	1000	.1040	7.6 *Qav= 8.8cfs n=.0300 Dn=.8 B=.0 Z=.2.0
38.00	10.0	15.0	4	6	2.2	13.4	3.48	.450	15.7	24.5	1100	.0600	16.4 *Qav= 24.5cfs n=.0130 Dn= 1.0 24.0"-PIPE
40.00	7.0	22.0	4	5	1.1	14.6	3.31	.550	12.7	37.2			
40.00	22.0				14.6				37.2				STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
5=SPECIFIED RUNOFF COEFFICIENT*

STUDY NAME: CITY OF SANTEE - BASIN Z

CALCULATED BY: NDB
CHECKED BY:

PAGE NUMBER 52 OF 53

100 .0-YEAR STORM RATIONAL METHOD STUDY				E N G I N E E R I N G S O F T W A R E				H Y D R A U L I C S			
CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV.	Tt	TC	I	C	Q	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
	SUBAREA	TOTAL	TYPE	MIN.	MIN.	in/h	(SUB)	TOTAL	(ft)		
2.00	6.0	6.0	4	6	..	12.2	3.71	.450	10.0	10.0	700 .2229 .. INITIAL SUBAREA
5.00	106.8	112.8	4	6	7.6	19.8	2.71	.450	130.4	140.4	1300 .0962 30.4 *Qav= 140.4 cfs n=.0130 Dn= 1.7 42.0"-PIPE
9.00	8.0	8.0	4	6	..	11.5	3.84	.450	13.8	13.8	350 .1371 .. INITIAL SUBAREA
10.00	94.5	102.5	4	6	5.7	17.2	2.97	.450	126.3	140.1	3200 .2234 9.4 *Qav= 13.8 cfs n=.0300 Dn= .3 B= 5.0 Z= 2.0
10.00	94.5	102.5	4	6	5.7	17.2	2.97	.450	126.3	140.1	3200 .2234 9.4 *Qav= 13.8 cfs n=.0300 Dn= .3 B= 5.0 Z= 2.0
10.00	94.5	102.5	4	6	5.7	17.2	2.97	.450	126.3	140.1	3200 .2234 9.4 *Qav= 13.8 cfs n=.0300 Dn= .3 B= 5.0 Z= 2.0
10.00	94.5	102.5	4	6	5.7	17.2	2.97	.450	126.3	140.1	3200 .2234 9.4 *Qav= 13.8 cfs n=.0300 Dn= .3 B= 5.0 Z= 2.0
10.00	94.5	102.5	4	6	5.7	17.2	2.97	.450	126.3	140.1	3200 .2234 9.4 *Qav= 13.8 cfs n=.0300 Dn= .3 B= 5.0 Z= 2.0
15.00	51.5	266.8	4	3	..	21.3	2.59	.700	93.2	358.8	1350 .0481 27.4 *Qav= 265.5 cfs n=.0130 Dn= 2.6 54.0"-PIPE

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-Units,
* 4=Mobile Home, 5=Single Family, 6=Rural LotsSOIL TYPES: 1=A, 2=B, 3=C, 4=D,
* 5=SPECIFIED RUNOFF COEFFICIENT *

STUDY NAME: CITY OF SANTEE --- BASIN Z

100.0-YEAR STORM RATIONAL METHOD STUDY | PAGE NUMBER 53 OF 53

CONCENTRATION POINT NUMBER	AREA (ACRES)	SOIL DEV. TYPE	TC TOTAL	I TYPE	C MIN.	Q (SUB)	Q TOTAL	PATH SLOPE (ft/ft)	V FPS.	HYDRAULICS AND NOTES
30.00	6.7	6.7	4	6	--	12.1	3.73	.450	11.2	660 .2197 .. INITIAL SUBAREA
35.00	22.8	29.5	4	6	--	2.1	14.1	3.37	.450	1000 .2200 8.0 *Qav= 11.2cfs n=.0300 Dn=.3 B= 5.0 Z= 2.0
40.00	11.4	40.9	4	5	--	.4	14.5	3.31	.550	34.6 45.8 350 .1143 14.6 *Qav= 45.8cfs n=.0240 Dn= 2.0 B= 24.0"-PIPE
45.00	10.2	51.1	4	5	--	.6	15.2	3.22	.550	20.7 66.5 650 .1077 16.7 *Qav= 66.5cfs n=.0240 Dn= 2.3 B= 27.0"-PIPE
50.00	38.8	89.9	4	5	--	.6	15.8	3.14	.550	18.0 84.6 600 .0833 17.2 *Qav= 84.6cfs n=.0240 Dn= 2.5 B= 30.0"-PIPE
55.00	20.2	110.1	4	5	--	.4	16.2	3.09	.550	34.3 185.9 700 .0714 30.9 *Qav= 151.6cfs n=.0240 Dn= 2.5 B= 30.0"-PIPE
65.00					--					ASSUMED DATA
					--					
70.00	18.9	20.5	4	5	--	2.4	14.3	3.35	.550	34.8 38.3 1050 .0552 7.3 *Qav= 3.4cfs n=.0150 Dn=.2 B= 2.0 Z= .0
70.00					--					STREAM SUMMARY

*DEVELOPMENT TYPES: 1=Industrial, 2=Commercial, 3=Multi-unit,
4=Mobile Home, 5=Single Family, 6=Rural Lots

SOIL TYPES: 1=A, 2=B, 3=C, 4=D,
0, 5=SPECIFIED RUNOFF COEFFICIENT

STUDY NAME: CITY OF SANTEE --- BASIN W

CALCULATED BY: NDB

APPENDIX IV

DETAILED PRINTOUT

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

(C) Copyright 1982, 1986 Advanced Engineering Software [AES]

Especially prepared for:

BSI CONSULTANTS

- * CITY OF SANTEE
- * 100-YEAR RUNOFF
- * BASIN A

SEPTEMBER 1989

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE 1.00 TO NCDE 2.00 IS CCDE = 2

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

RATIONAL METRIC INITIATE SCRAPPER ANNEX

SOIL CLASSIFICATION IS "D"

**SOIL CLASSIFICATION IS B
RURAL DEVELOPMENT BUNGEE C**

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCEN

NATURAL WATERSHED NUMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.93(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
UPSTREAM ELEVATION = 825.00
DOWNSTREAM ELEVATION = 615.00
ELEVATION DIFFERENCE = 210.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.760
SUBAREA RUNOFF(CFS) = 16.92
TOTAL AREA(ACRES) = 10.00 TOTAL RUNOFF(CFS) = 16.92

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 615.00
DOWNSTREAM NODE ELEVATION = 490.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 16.92
FLOW VELOCITY(FEET/SEC) = 5.96 FLOW DEPTH(FEET) = 1.19
TRAVEL TIME(MIN.) = 5.59 TC(MIN.) = 17.52

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.934
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 71.00 SUBAREA RUNOFF(CFS) = 93.74
TOTAL AREA(ACRES) = 81.00 TOTAL RUNOFF(CFS) = 110.66
TC(MIN) = 17.52

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 490.00
DOWNSTREAM NODE ELEVATION = 420.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 110.66
FLOW VELOCITY(FEET/SEC) = 8.72 FLOW DEPTH(FEET) = 2.52
TRAVEL TIME(MIN.) = 2.87 TC(MIN.) = 20.39

BASIN_A

 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.661
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SUBAREA AREA(ACRES) = 53.00 SUBAREA RUNOFF(CFS) = 63.45
 TOTAL AREA(ACRES) = 134.00 TOTAL RUNOFF(CFS) = 174.11
 TC(MIN) = 20.39

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<
 =====
 UPSTREAM NODE ELEVATION = 420.00
 DOWNSTREAM NODE ELEVATION = 374.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00
 CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 174.11
 FLOW VELOCITY(FEET/SEC) = 7.99 FLOW DEPTH(FEET) = 3.30
 TRAVEL TIME(MIN.) = 3.55 TC(MIN.) = 23.93

 FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.399
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SUBAREA AREA(ACRES) = 43.00 SUBAREA RUNOFF(CFS) = 46.42
 TOTAL AREA(ACRES) = 177.00 TOTAL RUNOFF(CFS) = 220.54
 TC(MIN) = 23.93

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

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
 =====
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MINUTES) = 23.93
 RAINFALL INTENSITY (INCH./HOUR) = 2.40
 TOTAL STREAM AREA (ACRES) = 177.00
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 220.54

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.46(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00

UPSTREAM ELEVATION = 883.00

DOWNSHIFT ELEVATION = 560.00

ELEVATION DIFFERENCE = 323.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.654

SUBAREA RUNOFF(CFS) = 16.44

TOTAL AREA(ACRES) = 10.00 TOTAL RUNOFF(CFS) = 16.44

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 560.00

DOWNSHIFT NODE ELEVATION = 430.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 16.44

FLOW VELOCITY(FEET/SEC) = 6.63 FLOW DEPTH(FEET) = 1.11

TRAVEL TIME(MIN.) = 3.77 TC(MIN.) = 16.23

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.082

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 55.47

TOTAL AREA(ACRES) = 50.00 TOTAL RUNOFF(CFS) = 71.92

TC(MIN) = 16.23

FLOW PROCESS FROM NODE 8.00 TO NODE 5.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 430.00

DOWNSHIFT NODE ELEVATION = 374.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 71.97
 FLOW VELOCITY(FEET/SEC) = 7.13 FLOW D'(FEET) = 2.25
 TRAVEL TIME(MIN.) = 3.51 TC(MIN.) = 24

 FLOW PROCESS FROM NODE 8.00 TO NODE 5.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE P
 ======
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.717
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = 4500
 SUBAREA AREA(ACRES) = 38.00 SUBAREA RUNOFF(CFS) = 46.45
 TOTAL AREA(ACRES) = 88.00 TOTAL RUNOFF(CFS) = 118.37
 TC(MIN) = 19.74

 FLOW PROCESS FROM NODE 5.00 TO 5.00 IS CODE = 1

 >>>>DESIGNATE INDEPENDENT STREAM CONFLUENCE<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCE STREAM VALUES<<<<
 ======
 CONFLUENCE VALUES USED FOR INDIVIDUAL STREAMS ARE:
 TIME OF CONCENTRATION(MINUTES) = 19.74
 RAINFALL INTENSITY (INCH./HOUR) = 2.72
 TOTAL STREAM AREA (ACRES) = 88.00
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 118.37

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	220.54	23.93	2.399
2	118.37	19.74	2.717

RAINFALL-INTENSITY-RATIO
 VARIOUS CONFLUENCE RUNOFF FORMULAS ARE AS FOLLOWS:
 325.08 313.14
 COMPUTED CONFLUENCE RUNOFF(CFS) = 325.0
 RUNOFF(CFS) = 325.0
 TOTAL AREA(ACRES) = 88.00

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW
 >>>>USING COMPUTED PIPELINES
 ======
 DEPTH OF FLOW IN PIPEFLOW VELOCITY = 45.8 INCHES
 /SEC.) = 20.2

UPSTREAM NODE ELEVATION = 374.00
DOWNSTREAM NODE ELEVATION = 369.00
FLOWLENGTH(FEET) = 250.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 325.08
TRAVEL TIME(MIN.) = .21 TC(MIN.) = 24.14

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.386
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 21.12 SUBAREA RUNOFF(CFS) = 27.71
TOTAL AREA(ACRES) = 286.12 TOTAL RUNOFF(CFS) = 352.79
TC(MIN) = 24.14

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 60.0 INCH PIPE IS 46.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 21.5
UPSTREAM NODE ELEVATION = 369.00
DOWNSTREAM NODE ELEVATION = 326.00
FLOWLENGTH(FEET) = 1900.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMEER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 352.79
TRAVEL TIME(MIN.) = 1.47 TC(MIN.) = 25.61

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CCDE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.297
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUEAREA AREA(ACRES) = 41.62 SUBAREA RUNCFF(CFS) = 52.57
TOTAL AREA(ACRES) = 327.74 TCTAL RUNOFF(CFS) = 405.36
TC(MIN) = 25.61

FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NCDE<<<<
=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 23.60 RAIN INTENSITY(INCH/HOUR) = 2.42

TOTAL AREA(ACRES) = 12.86 TOTAL RUNOFF(CFS) = 17.12

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RES

* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN B

SEPTEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00 6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

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SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = ?

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 18.96 RAIN INTENSITY(INCH/HOUR) = 2.79
TCTAL AREA(ACRES) = 9.15 TOTAL RUNOFF(CFS) = 14.03

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 355.00 DOWNSTREAM ELEVATION = 343.00
STREET LENGTH(FEET) = 370.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 24.73
STREET FLOWDEPTH(FEET) = .42
HALFSTREET FLOODWIDTH(FEET) = 14.58
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.51
PRODUCT OF DEPTH&VELOCITY = 2.30
STREETFLOW TRAVELTIME(MIN) = 1.12 TC(MIN) = 20.08

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.687
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 14.47 SUBAREA RUNOFF(CFS) = 21.38
SUMMED AREA(ACRES) = 23.62 TOTAL RUNOFF(CFS) = 35.41
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .46 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 6.31 DEPTH*VELOCITY = 2.87

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 9.4
UPSTREAM NODE ELEVATION = 343.00
DOWNSTREAM NODE ELEVATION = 340.00
FLOWLENGTH(FEET) = 270.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 35.41
TRAVEL TIME(MIN.) = .48 TC(MIN.) = 20.56

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.646
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 7.82 SUBAREA RUNOFF(CFS) = 11.38
TOTAL AREA(ACRES) = 31.44 TOTAL RUNOFF(CFS) = 46.80
TC(MIN) = 20.56

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.5
UPSTREAM NODE ELEVATION = 340.00
DOWNSTREAM NODE ELEVATION = 320.00
FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 46.80
TRAVEL TIME(MIN.) = 1.05 TC(MIN.) = 21.61

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.562
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 32.42
TOTAL AREA(ACRES) = 54.44 TOTAL RUNOFF(CFS) = 79.21
TC(MIN) = 21.61

FLOW PROCESS FROM NODE 26.00 TO NODE 27.00 IS CODE = 2

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

=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 13.38(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00
UPSTREAM ELEVATION = 502.00
DOWNSTREAM ELEVATION = 415.00
ELEVATION DIFFERENCE = 87.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.490
SUBAREA RUNOFF(CFS) = 15.71
TOTAL AREA(ACRES) = 10.00 TOTAL RUNOFF(CFS) = 15.71

FLOW PROCESS FROM NODE 27.00 TO NODE 30.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<
=====

UPSTREAM NODE ELEVATION = 415.00
DOWNSTREAM NODE ELEVATION = 365.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 15.71
FLOW VELOCITY(FEET/SEC) = 4.87 FLOW DEPTH(FEET) = 1.27
TRAVEL TIME(MIN.) = 4.62 TC(MIN.) = 18.00

FLOW PROCESS FROM NODE 27.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2,883
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 31.97 SUBAREA RUNOFF(CFS) = 41.48
TOTAL AREA(ACRES) = 41.97 TOTAL RUNOFF(CFS) = 57.18
TC(MIN) = 18.00

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 365.00
DOWNSTREAM NODE ELEVATION = 330.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1250.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 57.18
FLOW VELOCITY(FEET/SEC) = 6.08 FLOW DEPTH(FEET) = 2.17
TRAVEL TIME(MIN.) = 3.42 TC(MIN.) = 21.43

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CCDE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.577
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 16.10 SUBAREA RUNOFF(CFS) = 22.82
TOTAL AREA(ACRES) = 58.07 TOTAL RUNOFF(CFS) = 80.00
TC(MIN) = 21.43

FLOW PROCESS FROM NODE 38.00 TO NCDE 39.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 18.94 RAIN INTENSITY(INCH/HOUR) = 2.79
TOTAL AREA(ACRES) = 9.10 TOTAL RUNOFF(CFS) = 13.96

FLOW PROCESS FROM NODE 39.00 TO NODE 40.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 363.00 DOWNSTREAM ELEVATION = 328.00
STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 19.03
STREET FLOWDEPTH(FEET) = .37
HALFSTREET FLOODWIDTH(FEET) = 12.05
AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.06
PRODUCT OF DEPTH&VELOCITY = 2.23
STREETFLOW TRAVELTIME(MIN) = 1.79 TC(MIN) = 20.73

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.632
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 7.00 SUBAREA RUNOFF(CFS) = 10.13
SUMMED AREA(ACRES) = 16.10 TOTAL RUNOFF(CFS) = 24.09
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .40 HALFSTREET FLOODWIDTH(FEET) = 13.73
FLOW VELOCITY(FEET/SEC.) = 6.01 DEPTH*VELOCITY = 2.41

FLOW PROCESS FROM NODE 43.00 TO NODE 44.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 25.66 RAIN INTENSITY(INCH/HOUR) = 2.29
TOTAL AREA(ACRES) = 9.00 TOTAL RUNOFF(CFS) = 11.35

FLOW PROCESS FROM NODE 44.00 TO NODE 45.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 345.00 DOWNSTREAM ELEVATION = 320.00
STREET LENGTH(FEET) = 800.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 17.02
STREET FLOWDEPTH(FEET) = .38
HALFSTREET FLOODWIDTH(FEET) = 12.89

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.78
PRODUCT OF DEPTH&VELOCITY = 1.84
STREETFLOW TRAVELTIME(MIN) = 2.79 TC(MIN) = 28.45

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.146
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 9.60 SUBAREA RUNOFF(CFS) = 11.33
SUMMED AREA(ACRES) = 18.60 TOTAL RUNOFF(CFS) = 22.68
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .42 HALFSTREET FLOODWIDTH(FEET) = 14.58
FLOW VELOCITY(FEET/SEC.) = 5.06 DEPTH*VELOCITY = 2.11

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN C

JANUARY 1990 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

ANALYTICAL METHOD INITIAL SUBAREA ANALYSIS < < < <

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

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SOIL CLASSIFICATION IS "D"

SITE CLASSIFICATION IS 3
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.97(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 250.00
UPSTREAM ELEVATION = 419.00
DOWNSTREAM ELEVATION = 410.00
ELEVATION DIFFERENCE = 9.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.901
SUBAREA RUNOFF(CFS) = 2.51
TOTAL AREA(ACRES) = 1.43 TOTAL RUNOFF(CFS) = 2.51

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 410.00
DOWNSTREAM NODE ELEVATION = 377.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 450.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 5.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2.51
FLOW VELOCITY(FEET/SEC) = 2.67 FLOW DEPTH(FEET) = .18
TRAVEL TIME(MIN.) = 2.81 TC(MIN.) = 14.78

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.405
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 8.41 SUBAREA RUNOFF(CFS) = 15.75
TOTAL AREA(ACRES) = 9.84 TOTAL RUNOFF(CFS) = 18.26
TC(MIN) = 14.78

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 10.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.2
UPSTREAM NODE ELEVATION = 377.00
DOWNSTREAM NODE ELEVATION = 340.00
FLOWLENGTH(FEET) = 900.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 18.26
TRAVEL TIME(MIN.) = 1.13 TC(MIN.) = 15.92

```
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      5.00 IS CODE =  8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.246
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) =  24.23   SUBAREA RUNOFF(CFS) =  43.26
TOTAL AREA(ACRES) =  34.07   TOTAL RUNOFF(CFS) =  61.52
TC(MIN) =  15.92

*****
FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  2
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 13.87(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
UPSTREAM ELEVATION = 500.00
DOWNSTREAM ELEVATION = 400.00
ELEVATION DIFFERENCE = 100.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.547
SUBAREA RUNOFF(CFS) = 15.96
TOTAL AREA(ACRES) = 10.00   TOTAL RUNOFF(CFS) = 15.96

*****
FLOW PROCESS FROM NODE      7.00 TO NODE      10.00 IS CODE =  6
-----
>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 400.00   DOWNSTREAM ELEVATION = 353.00
STREET LENGTH(FEET) = 1200.00   CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00   STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFWESTREETS CARRYING RUNOFF = 2
    **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 31.71
    ***STREET FLOWING FULL***
    STREET FLOWDEPTH(FEET) = .44
    HALFWESTREET FLOODWIDTH(FEET) = 15.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.30
    PRODUCT OF DEPTH&VELOCITY = 2.75
    STREETFLOW TRAVELTIME(MIN) = 3.17   TC(MIN) = 17.04

    100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.106
    SOIL CLASSIFICATION IS "D"
    SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
    SUBAREA AREA(ACRES) = 18.50   SUBAREA RUNOFF(CFS) = 31.60
    SUMMED AREA(ACRES) = 28.50   TOTAL RUNOFF(CFS) = 47.57
    END OF SUBAREA STREETFLOW HYDRAULICS:
```

DEPTH(FEET) = .48 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 7.67 DEPTH*VELOCITY = 3.64

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 13.49(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1200.00

UPSTREAM ELEVATION = 706.00

DOWNSTREAM ELEVATION = 480.00

ELEVATION DIFFERENCE = 226.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.612

SUBAREA RUNOFF(CFS) = 13.81

TOTAL AREA(ACRES) = 8.50 TOTAL RUNOFF(CFS) = 13.81

FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 480.00

DOWNSTREAM NODE ELEVATION = 400.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 13.81

FLOW VELOCITY(FEET/SEC) = 6.45 FLOW DEPTH(FEET) = 1.04

TRAVEL TIME(MIN.) = 2.59 TC(MIN.) = 16.08

FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.225

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 26.13

TOTAL AREA(ACRES) = 26.50 TOTAL RUNOFF(CFS) = 39.94

TC(MIN) = 16.08

FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.0
UPSTREAM NODE ELEVATION = 400.00
DOWNSTREAM NODE ELEVATION = 340.00
FLOWLENGTH(FEET) = 1400.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 39.94
TRAVEL TIME(MIN.) = 1.46 TC(MIN.) = 17.53

FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.050
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 27.00 SUBAREA RUNOFF(CFS) = 45.29
TOTAL AREA(ACRES) = 53.50 TOTAL RUNOFF(CFS) = 85.23
TC(MIN) = 17.53

FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.37(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00
UPSTREAM ELEVATION = 780.00
DOWNSTREAM ELEVATION = 520.00
ELEVATION DIFFERENCE = 260.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.819
SUBAREA RUNOFF(CFS) = 14.61
TOTAL AREA(ACRES) = 8.50 TOTAL RUNOFF(CFS) = 14.61

FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 520.00
DOWNSTREAM NODE ELEVATION = 400.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1400.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 14.61

FLOW VELOCITY(FEET/SEC) = 6.82 FLOW DEPTH(FEET) = 1.04
TRAVEL TIME(MIN.) = 3.42 TC(MIN.) = 15.79

FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.262

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 29.36

TOTAL AREA(ACRES) = 28.50 TOTAL RUNOFF(CFS) = 43.97

TC(MIN) = 15.79

FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.1 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 17.3

UPSTREAM NODE ELEVATION = 400.00

DOWNTSTREAM NODE ELEVATION = 345.00

FLOWLENGTH(FEET) = 1100.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 43.97

TRAVEL TIME(MIN.) = 1.06 TC(MIN.) = 16.85

FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.129

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 23.00 SUBAREA RUNOFF(CFS) = 39.58

TOTAL AREA(ACRES) = 51.50 TOTAL RUNOFF(CFS) = 83.54

TC(MIN) = 16.85

FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.60(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
UPSTREAM ELEVATION = 780.00
DOWNSTREAM ELEVATION = 500.00
ELEVATION DIFFERENCE = 280.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.773
SUBAREA RUNOFF(CFS) = 14.43
TOTAL AREA(ACRES) = 8.50 TOTAL RUNOFF(CFS) = 14.43

FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 500.00
DOWNSTREAM NODE ELEVATION = 395.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1200.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 14.43
FLOW VELOCITY(FEET/SEC) = 6.73 FLOW DEPTH(FEET) = 1.04
TRAVEL TIME(MIN.) = 2.97 TC(MIN.) = 15.57

FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.292
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 14.00 SUBAREA RUNOFF(CFS) = 20.74
TOTAL AREA(ACRES) = 22.50 TOTAL RUNOFF(CFS) = 35.17
TC(MIN.) = 15.57

FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 13.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 19.5
UPSTREAM NODE ELEVATION = 395.00
DOWNSTREAM NODE ELEVATION = 350.00
FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 35.17
TRAVEL TIME(MIN.) = .51 TC(MIN.) = 16.08

FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.224
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 8.50 SUBAREA RUNOFF(CFS) = 15.07
TOTAL AREA(ACRES) = 31.00 TOTAL RUNOFF(CFS) = 50.25
TC(MIN) = 16.08

FLOW PROCESS FROM NODE 27.00 TO NODE 28.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.43(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00
UPSTREAM ELEVATION = 825.00
DOWNSTREAM ELEVATION = 580.00
ELEVATION DIFFERENCE = 245.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.808
SUBAREA RUNOFF(CFS) = 12.17
TOTAL AREA(ACRES) = 7.10 TOTAL RUNOFF(CFS) = 12.17

FLOW PROCESS FROM NODE 28.00 TO NODE 29.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 580.00
DOWNSTREAM NODE ELEVATION = 400.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 12.17
FLOW VELOCITY(FEET/SEC) = 6.64 FLOW DEPTH(FEET) = .96
TRAVEL TIME(MIN.) = 5.02 TC(MIN.) = 17.45

FLOW PROCESS FROM NODE 28.00 TO NODE 29.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.060
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 40.00 SUBAREA RUNOFF(CFS) = 55.07
TOTAL AREA(ACRES) = 47.10 TOTAL RUNOFF(CFS) = 67.24
TC(MIN) = 17.45

FLOW PROCESS FROM NODE 29.00 TO NODE 30.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 23.7
UPSTREAM NODE ELEVATION = 400.00
DOWNSTREAM NODE ELEVATION = 350.00
FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 67.24
TRAVEL TIME(MIN.) = .42 TC(MIN.) = 17.87

FLOW PROCESS FROM NODE 29.00 TO NODE 30.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.013
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 7.10 SUBAREA RUNOFF(CFS) = 11.76
TOTAL AREA(ACRES) = 54.20 TOTAL RUNOFF(CFS) = 79.00
TC(MIN) = 17.87

FLOW PROCESS FROM NODE 32.00 TO NODE 33.00 IS CODE = 2

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

=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.16(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 650.00
UPSTREAM ELEVATION = 625.00
DOWNSTREAM ELEVATION = 500.00
ELEVATION DIFFERENCE = 125.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.862
SUBAREA RUNOFF(CFS) = 6.95
TOTAL AREA(ACRES) = 4.00 TOTAL RUNOFF(CFS) = 6.95

FLOW PROCESS FROM NODE 33.00 TO NODE 34.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION = 500.00

DOWNTSTREAM NODE ELEVATION = 400.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 800.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 6.95

FLOW VELOCITY(FEET/SEC) = 5.99 FLOW DEPTH(FEET) = .76

TRAVEL TIME(MIN.) = 2.23 TC(MIN.) = 14.38

FLOW PROCESS FROM NODE 33.00 TO NODE 34.00 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.465

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 18.50 SUBAREA RUNOFF(CFS) = 28.85

TOTAL AREA(ACRES) = 22.50 TOTAL RUNOFF(CFS) = 35.80

TC(MIN) = 14.38

FLOW PROCESS FROM NODE 34.00 TO NODE 35.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

=====

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000

DEPTH OF FLOW IN 24.0 INCH PIPE IS 13.5 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 19.6

UPSTREAM NODE ELEVATION = 400.00

DOWNTSTREAM NODE ELEVATION = 355.00

FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 35.80

TRAVEL TIME(MIN.) = .51 TC(MIN.) = 14.89

FLOW PROCESS FROM NODE 34.00 TO NODE 35.00 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.388

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 11.00 SUBAREA RUNOFF(CFS) = 20.50

TOTAL AREA(ACRES) = 33.50 TOTAL RUNOFF(CFS) = 56.29

TC(MIN) = 14.89

FLOW PROCESS FROM NODE 40.00 TO NODE 41.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00

UPSTREAM ELEVATION = 820.00

DOWNSHIFT ELEVATION = 580.00

ELEVATION DIFFERENCE = 240.00

URBAN SUBAREA OVERLAND TIME OF FLOW(MINUTES) = 41.395

*CAUTION: SUBAREA SLOPE EXCEEDS COUNTY NOMOGRAPH DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.

*CAUTION: SUBAREA FLOWLENGTH EXCEEDS COUNTY NOMOGRAPH DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.752

SUBAREA RUNOFF(CFS) = 10.25

TOTAL AREA(ACRES) = 13.00 TOTAL RUNOFF(CFS) = 10.25

FLOW PROCESS FROM NODE 41.00 TO NODE 42.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 580.00

DOWNSHIFT NODE ELEVATION = 460.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 2200.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 10.25

FLOW VELOCITY(FEET/SEC) = 5.17 FLOW DEPTH(FEET) = 1.00

TRAVEL TIME(MIN.) = 7.10 TC(MIN.) = 48.49

FLOW PROCESS FROM NODE 41.00 TO NODE 42.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.582

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 92.00 SUBAREA RUNOFF(CFS) = 65.51

TOTAL AREA(ACRES) = 105.00 TOTAL RUNOFF(CFS) = 75.76

TC(MIN) = 48.49

FLOW PROCESS FROM NODE 42.00 TO NODE 43.00 IS CODE = 5

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

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

UPSTREAM NODE ELEVATION = 460.00
DOWNSTREAM NODE ELEVATION = 400.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 4600.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 75.76
FLOW VELOCITY(FEET/SEC) = 4.86 FLOW DEPTH(FEET) = 2.79
TRAVEL TIME(MIN.) = 15.79 TC(MIN.) = 64.28

FLOW PROCESS FROM NODE 42.00 TO NODE 43.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.319
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 34.00 SUBAREA RUNOFF(CFS) = 20.18
TOTAL AREA(ACRES) = 139.00 TOTAL RUNOFF(CFS) = 95.94
TC(MIN) = 64.28

FLOW PROCESS FROM NODE 43.00 TO NODE 43.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 64.28
RAINFALL INTENSITY (INCH./HOUR) = 1.32
TOTAL STREAM AREA (ACRES) = 139.00
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 95.94

FLOW PROCESS FROM NODE 36.00 TO NODE 37.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 14.07(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1400.00
UPSTREAM ELEVATION = 1001.00
DOWNSTREAM ELEVATION = 760.00
ELEVATION DIFFERENCE = 241.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.515
SUBAREA RUNOFF(CFS) = 20.25
TOTAL AREA(ACRES) = 12.80 TOTAL RUNOFF(CFS) = 20.25

```
*****  
FLOW PROCESS FROM NODE 37.00 TO NODE 38.00 IS CODE = 5  
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>>TRAVELTIME THRU SUBAREA<<<  
=====  
UPSTREAM NODE ELEVATION = 760.00  
DOWNSTREAM NODE ELEVATION = 540.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 3000.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 20.25  
FLOW VELOCITY(FEET/SEC) = 6.69 FLOW DEPTH(FEET) = 1.23  
TRAVEL TIME(MIN.) = 7.48 TC(MIN.) = 21.55  
  
*****  
FLOW PROCESS FROM NODE 37.00 TO NODE 38.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.670  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 151.00 SUBAREA RUNOFF(CFS) = 181.43  
TOTAL AREA(ACRES) = 163.80 TOTAL RUNOFF(CFS) = 201.68  
TC(MIN) = 21.55  
  
*****  
FLOW PROCESS FROM NODE 38.00 TO NODE 39.00 IS CODE = 5  
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>>TRAVELTIME THRU SUBAREA<<<  
=====  
UPSTREAM NODE ELEVATION = 540.00  
DOWNSTREAM NODE ELEVATION = 460.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1255.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 201.68  
FLOW VELOCITY(FEET/SEC) = 11.29 FLOW DEPTH(FEET) = 2.99  
TRAVEL TIME(MIN.) = 1.85 TC(MIN.) = 23.40  
  
*****  
FLOW PROCESS FROM NODE 38.00 TO NODE 39.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.532  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 168.00 SUBAREA RUNOFF(CFS) = 191.40  
TOTAL AREA(ACRES) = 331.80 TOTAL RUNOFF(CFS) = 393.09
```

TC(MIN) = 23.40

FLOW PROCESS FROM NODE 39.00 TO NODE 43.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<

UPSTREAM NODE ELEVATION = 460.00
DOWNSTREAM NODE ELEVATION = 400.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1245.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = .10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 393.09
FLOW VELOCITY(FEET/SEC) = 12.02 FLOW DEPTH(FEET) = 4.04
TRAVEL TIME(MIN.) = 1.73 TC(MIN.) = 25.12

FLOW PROCESS FROM NODE 39.00 TO NODE 43.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.418
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 88.00 SUBAREA RUNOFF(CFS) = 95.76
TOTAL AREA(ACRES) = 419.80 TOTAL RUNOFF(CFS) = 488.85
TC(MIN) = 25.12

FLOW PROCESS FROM NODE 43.00 TO NODE 43.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 25.12
RAINFALL INTENSITY (INCH./HOUR) = 2.42
TOTAL STREAM AREA (ACRES) = 419.80
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 488.85

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	95.94	64.28	1.319
2	488.85	25.12	2.418

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

362.63 541.19

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 541.19 TIME(MINUTES) = 25.124
TOTAL AREA(ACRES) = 558.80

FLOW PROCESS FROM NODE 43.00 TO NODE 44.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 400.00
DOWNSTREAM NODE ELEVATION = 380.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 541.19
FLOW VELOCITY(FEET/SEC) = 12.21 FLOW DEPTH(FEET) = 4.71
TRAVEL TIME(MIN.) = .68 TC(MIN.) = 25.81

FLOW PROCESS FROM NODE 43.00 TO NODE 44.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.377
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 12.80 SUBAREA RUNOFF(CFS) = 13.69
TOTAL AREA(ACRES) = 571.60 TOTAL RUNOFF(CFS) = 554.88
TC(MIN) = 25.81

FLOW PROCESS FROM NODE 44.00 TO NODE 45.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 42.2
UPSTREAM NODE ELEVATION = 380.00
DOWNSTREAM NODE ELEVATION = 350.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 554.88
TRAVEL TIME(MIN.) = .12 TC(MIN.) = 25.92

FLOW PROCESS FROM NODE 44.00 TO NODE 45.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.370

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 3.00 SUBAREA RUNOFF(CFS) = 3.91

TOTAL AREA(ACRES) = 574.60 TOTAL RUNOFF(CFS) = 558.79

TC(MIN) = 25.92

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985-1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*DESCRIPTION OF RESULTS

- * CITY OF SANTEE
- * 100-YEAR RUNOFF
- * BASIN D

JANUARY 1990 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

USER-SPECIFIED VALUES ARE AS FOLLOWS
TC(MIN) = 13.61 RAIN INTENSITY(INCH/HOUR) = 3.73
TOTAL AREA(ACRES) = 11.48 TOTAL RUNOFF(CFS) = 22.67

FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 550.00 DOWNSTREAM ELEVATION = 472.00
STREET LENGTH(FEET) = 1200.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 30.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 59.42

NOTE: STREETFLOW EXCEEDS TOP OF CURB.

THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .50

HALFSTREET FLOODWIDTH(FEET) = 18.87

AVERAGE FLOW VELOCITY(FEET/SEC.) = 8.08

PRODUCT OF DEPTH&VELOCITY = 4.07

STREETFLOW TRAVELTIME(MIN) = 2.48 TC(MIN) = 16.09

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.348

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 39.76 SUBAREA RUNOFF(CFS) = 73.21
SUMMED AREA(ACRES) = 51.24 TOTAL RUNOFF(CFS) = 95.88

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .57 HALFSTREET FLOODWIDTH(FEET) = 22.43

FLOW VELOCITY(FEET/SEC.) = 9.31 DEPTH*VELOCITY = 5.35

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 472.00

DOWNSTREAM NODE ELEVATION = 375.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 95.88

FLOW VELOCITY(FEET/SEC) = 9.84 FLOW DEPTH(FEET) = 2.21

TRAVEL TIME(MIN.) = 2.88 TC(MIN.) = 18.96

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.011

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 23.60 SUBAREA RUNOFF(CFS) = 39.08
 TOTAL AREA(ACRES) = 74.84 TOTAL RUNOFF(CFS) = 134.96
 TC(MIN) = 18.96

 FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 300.00
 UPSTREAM ELEVATION = 525.00
 DOWNSTREAM ELEVATION = 485.00
 ELEVATION DIFFERENCE = 40.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MINUTES) = 15.773
 *CAUTION: SUBAREA SLOPE EXCEEDS COUNTY NOMOGRAPH
 DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.391
 SUBAREA RUNOFF(CFS) = 5.22
 TOTAL AREA(ACRES) = 2.80 TOTAL RUNOFF(CFS) = 5.22

 FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
 =====

UPSTREAM ELEVATION = 485.00 DOWNSTREAM ELEVATION = 365.00
 STREET LENGTH(FEET) = 1700.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 30.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 14.89
 STREET FLOWDEPTH(FEET) = .34
 HALFSTREET FLOODWIDTH(FEET) = 10.85
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.75
 PRODUCT OF DEPTH&VELOCITY = 1.97
 STREETFLOW TRAVELTIME(MIN) = 4.93 TC(MIN) = 20.70

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.845
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 12.17 SUBAREA RUNOFF(CFS) = 19.04
 SUMMED AREA(ACRES) = 14.97 TOTAL RUNOFF(CFS) = 24.27
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .38 HALFSTREET FLOODWIDTH(FEET) = 12.63
 FLOW VELOCITY(FEET/SEC.) = 7.08 DEPTH*VELOCITY = 2.68

 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 7.96 RAIN INTENSITY(INCH/HOUR) = 5.27
TOTAL AREA(ACRES) = 2.90 TOTAL RUNOFF(CFS) = 8.10

FLOW PROCESS FROM NODE 17.00 TO NODE 20.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM ELEVATION = 440.00 DOWNSTREAM ELEVATION = 390.00
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 19.27
STREET FLOWDEPTH(FEET) = .38
HALFSTREET FLOODWIDTH(FEET) = 12.89
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.41
PRODUCT OF DEPTH&VELOCITY = 2.08
STREETFLOW TRAVELTIME(MIN) = 3.08 TC(MIN) = 11.04

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.268
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 9.36 SUBAREA RUNOFF(CFS) = 21.97
SUMMED AREA(ACRES) = 12.26 TOTAL RUNOFF(CFS) = 30.07
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .42 HALFSTREET FLOODWIDTH(FEET) = 14.58
FLOW VELOCITY(FEET/SEC.) = 6.70 DEPTH*VELOCITY = 2.80

FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 8.86 RAIN INTENSITY(INCH/HOUR) = 4.92
TOTAL AREA(ACRES) = 6.73 TOTAL RUNOFF(CFS) = 17.53

FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM ELEVATION = 535.00 DOWNSTREAM ELEVATION = 470.00
STREET LENGTH(FEET) = 800.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 22.68
STREET FLOWDEPTH(FEET) = .37
HALFSTREET FLOODWIDTH(FEET) = 12.05
AVERAGE FLOW VELOCITY(FEET/SEC.) = 7.22

PRODUCT OF DEPTH&VELOCITY = 2.65
STREETFLOW TRAVELTIME(MIN) = 1.85 TC(MIN) = 10.71

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.354
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 4.29 SUBAREA RUNOFF(CFS) = 10.27
SUMMED AREA(ACRES) = 11.02 TOTAL RUNOFF(CFS) = 27.80
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .38 HALFSTREET FLOODWIDTH(FEET) = 12.89
FLOW VELOCITY(FEET/SEC.) = 7.81 DEPTH*VELOCITY = 3.00

FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 12.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 17.1
UPSTREAM NODE ELEVATION = 470.00
DOWNSTREAM NODE ELEVATION = 409.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 27.80
TRAVEL TIME(MIN.) = .98 TC(MIN.) = 11.68

FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.115
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 4.70 SUBAREA RUNOFF(CFS) = 10.64
TOTAL AREA(ACRES) = 15.72 TOTAL RUNOFF(CFS) = 38.44
TC(MIN) = 11.68

FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.4
UPSTREAM NODE ELEVATION = 409.00
DOWNSTREAM NODE ELEVATION = 405.00
FLOWLENGTH(FEET) = 150.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 38.44
TRAVEL TIME(MIN.) = .19 TC(MIN.) = 11.87

FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 11.87
RAINFALL INTENSITY (INCH./HOUR) = 4.07
TOTAL STREAM AREA (ACRES) = 15.72
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 38.44

FLOW PROCESS FROM NODE 26.00 TO NODE 27.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 18.90 RAIN INTENSITY(INCH/HOUR) = 3.02
TOTAL AREA(ACRES) = 7.93 TOTAL RUNOFF(CFS) = 12.67

FLOW PROCESS FROM NODE 27.00 TO NODE 25.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

=====
UPSTREAM ELEVATION = 435.00 DOWNSTREAM ELEVATION = 405.00
STREET LENGTH(FEET) = 530.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 13.96
STREET FLOWDEPTH(FEET) = .33
HALFSTREET FLOODWIDTH(FEET) = 10.36
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.86
PRODUCT OF DEPTH&VELOCITY = 1.95
STREETFLOW TRAVELTIME(MIN) = 1.51 TC(MIN) = 20.41

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.872
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 1.63 SUBAREA RUNOFF(CFS) = 2.57
SUMMED AREA(ACRES) = 9.56 TOTAL RUNOFF(CFS) = 15.24
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .35 HALFSTREET FLOODWIDTH(FEET) = 11.20
FLOW VELOCITY(FEET/SEC.) = 5.55 DEPTH*VELOCITY = 1.94

FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

=====
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.41
 RAINFALL INTENSITY (INCH./HOUR) = 2.87
 TOTAL STREAM AREA (ACRES) = 9.56
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 15.24

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	38.44	11.87	4.073
2	15.24	20.41	2.872

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

49.19 42.34

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 49.19 TIME(MINUTES) = 11.868
 TOTAL AREA(ACRES) = 25.28

 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.2 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 20.4
 UPSTREAM NODE ELEVATION = 405.00
 DOWNSTREAM NODE ELEVATION = 379.00
 FLOWLENGTH(FEET) = 370.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 49.19
 TRAVEL TIME(MIN.) = .30 TC(MIN.) = 12.17

 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.008
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 3.28 SUBAREA RUNOFF(CFS) = 7.23
 TOTAL AREA(ACRES) = 28.56 TOTAL RUNOFF(CFS) = 56.42
 TC(MIN) = 12.17

 FLOW PROCESS FROM NODE 31.00 TO NODE 32.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 9.18 RAIN INTENSITY(INCH/HOUR) = 4.81
TOTAL AREA(ACRES) = 4.80 TOTAL RUNOFF(CFS) = 12.22

FLOW PROCESS FROM NODE 32.00 TO NODE 35.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 445.00 DOWNSTREAM ELEVATION = 388.00
STREET LENGTH(FEET) = 900.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 37.22
STREET FLOWING FULL
STREET FLOWDEPTH(FEET) = .44
HALFSTREET FLOODWIDTH(FEET) = 15.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 7.40
PRODUCT OF DEPTH&VELOCITY = 3.23
STREETFLOW TRAVELTIME(MIN) = 2.03 TC(MIN) = 11.21

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.227
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 21.37 SUBAREA RUNOFF(CFS) = 49.68
SUMMED AREA(ACRES) = 26.17 TOTAL RUNOFF(CFS) = 61.90
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .49 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 9.12 DEPTH*VELOCITY = 4.51

FLOW PROCESS FROM NODE 36.00 TO NODE 37.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 9.83 RAIN INTENSITY(INCH/HOUR) = 4.60
TOTAL AREA(ACRES) = 4.10 TOTAL RUNOFF(CFS) = 9.99

FLOW PROCESS FROM NODE 37.00 TO NODE 40.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 650.00 DOWNSTREAM ELEVATION = 455.00
STREET LENGTH(FEET) = 2000.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 75.81

STREET FLOWING FULL
STREET FLOWDEPTH(FEET) = .49
HALFSTREET FLOODWIDTH(FEET) = 15.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 11.17
PRODUCT OF DEPTH&VELOCITY = 5.52
STREETFLOW TRAVELTIME(MIN) = 2.98 TC(MIN) = 12.81

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.877
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 60.82 SUBAREA RUNOFF(CFS) = 129.68
SUMMED AREA(ACRES) = 64.92 TOTAL RUNOFF(CFS) = 139.67
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .57 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 15.30 DEPTH*VELOCITY = 8.76

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
=====
DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 25.0
UPSTREAM NODE ELEVATION = 455.00
DOWNSTREAM NODE ELEVATION = 400.00
FLOWLENGTH(FEET) = 900.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 139.67
TRAVEL TIME(MIN.) = .60 TC(MIN.) = 13.41

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.764
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 11.66 SUBAREA RUNOFF(CFS) = 24.14
TOTAL AREA(ACRES) = 76.58 TOTAL RUNOFF(CFS) = 163.81
TC(MIN) = 13.41

FLOW PROCESS FROM NODE 46.00 TO NODE 50.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.95(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1050.00
UPSTREAM ELEVATION = 680.00
DOWNSTREAM ELEVATION = 445.00
ELEVATION DIFFERENCE = 235.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.851
SUBAREA RUNOFF(CFS) = 21.39
TOTAL AREA(ACRES) = 12.34 TOTAL RUNOFF(CFS) = 21.39

FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 8.3 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 22.2
UPSTREAM NODE ELEVATION = 445.00
DOWNSTREAM NODE ELEVATION = 400.00
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 21.39
TRAVEL TIME(MIN.) = .23 TC(MIN.) = 13.17

FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.809
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 20.95
TOTAL AREA(ACRES) = 22.34 TOTAL RUNOFF(CFS) = 42.33
TC(MIN) = 13.17

FLOW PROCESS FROM NODE 56.00 TO NODE 60.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.78(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1060.00
UPSTREAM ELEVATION = 830.00
DOWNSTREAM ELEVATION = 550.00
ELEVATION DIFFERENCE = 280.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.883
SUBAREA RUNOFF(CFS) = 18.68
TOTAL AREA(ACRES) = 10.69 TOTAL RUNOFF(CFS) = 18.68

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*****  
FLOW PROCESS FROM NODE    60.00 TO NODE    65.00 IS CODE =  5  
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====  
UPSTREAM NODE ELEVATION =  550.00  
DOWNSTREAM NODE ELEVATION =  475.00  
CHANNEL LENGTH THRU SUBAREA(FEET) =  90.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR =  2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 18.68  
FLOW VELOCITY(FEET/SEC) = 17.88 FLOW DEPTH(FEET) = .72  
TRAVEL TIME(MIN.) = .08 TC(MIN.) = 12.87  
*****  
FLOW PROCESS FROM NODE    60.00 TO NODE    65.00 IS CODE =  8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.866  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 12.92 SUBAREA RUNOFF(CFS) = 22.48  
TOTAL AREA(ACRES) = 23.61 TOTAL RUNOFF(CFS) = 41.16  
TC(MIN) = 12.87  
*****  
FLOW PROCESS FROM NODE    65.00 TO NODE    70.00 IS CODE =  3  
-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000  
DEPTH OF FLOW IN 24.0 INCH PIPE IS 12.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 24.3  
UPSTREAM NODE ELEVATION = 475.00  
DOWNSTREAM NODE ELEVATION = 415.00  
FLOWLENGTH(FEET) = 500.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 41.16  
TRAVEL TIME(MIN.) = .34 TC(MIN.) = 13.21  
*****  
FLOW PROCESS FROM NODE    65.00 TO NODE    70.00 IS CODE =  8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.801  
SOIL CLASSIFICATION IS "D"
```

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 13.95 SUBAREA RUNOFF(CFS) = 23.86
TOTAL AREA(ACRES) = 37.56 TOTAL RUNOFF(CFS) = 65.02
TC(MIN) = 13.21

FLOW PROCESS FROM NODE 71.00 TO NODE 75.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.07(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 780.00
UPSTREAM ELEVATION = 930.00
DOWNSTREAM ELEVATION = 690.00
ELEVATION DIFFERENCE = 240.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.029
SUBAREA RUNOFF(CFS) = 19.71
TOTAL AREA(ACRES) = 10.87 TOTAL RUNOFF(CFS) = 19.71

FLOW PROCESS FROM NODE 75.00 TO NODE 80.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 690.00
DOWNSTREAM NODE ELEVATION = 575.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1100.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 19.71
FLOW VELOCITY(FEET/SEC) = 8.54 FLOW DEPTH(FEET) = 1.07
TRAVEL TIME(MIN.) = 2.15 TC(MIN.) = 14.22

FLOW PROCESS FROM NODE 75.00 TO NODE 80.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.625
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 25.27 SUBAREA RUNOFF(CFS) = 41.22
TOTAL AREA(ACRES) = 36.14 TOTAL RUNOFF(CFS) = 60.93
TC(MIN) = 14.22

FLOW PROCESS FROM NODE 80.00 TO NODE 85.00 IS CODE = 5

```
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====  
UPSTREAM NODE ELEVATION = 575.00  
DOWNSTREAM NODE ELEVATION = 525.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 950.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 60.93  
FLOW VELOCITY(FEET/SEC) = 8.49 FLOW DEPTH(FEET) = 1.89  
TRAVEL TIME(MIN.) = 1.87 TC(MIN.) = 16.09  
  
*****  
FLOW PROCESS FROM NODE 80.00 TO NODE 85.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.348  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 39.63 SUBAREA RUNOFF(CFS) = 59.71  
TOTAL AREA(ACRES) = 75.77 TOTAL RUNOFF(CFS) = 120.63  
TC(MIN) = 16.09  
  
*****  
FLOW PROCESS FROM NODE 85.00 TO NODE 90.00 IS CODE = 5  
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====  
UPSTREAM NODE ELEVATION = 525.00  
DOWNSTREAM NODE ELEVATION = 470.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 770.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 120.63  
FLOW VELOCITY(FEET/SEC) = 11.55 FLOW DEPTH(FEET) = 2.29  
TRAVEL TIME(MIN.) = 1.11 TC(MIN.) = 17.20  
  
*****  
FLOW PROCESS FROM NODE 85.00 TO NODE 90.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.207  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 39.39 SUBAREA RUNOFF(CFS) = 56.84  
TOTAL AREA(ACRES) = 115.16 TOTAL RUNOFF(CFS) = 177.48  
TC(MIN) = 17.20
```

FLOW PROCESS FROM NODE 90.00 TO NODE 95.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 470.00 DOWNSTREAM ELEVATION = 425.00
STREET LENGTH(FEET) = 1040.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 195.63

STREET FLOWING FULL

NOTE: STREETFLOW EXCEEDS TOP OF CURB.

THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
THAT NEGЛИBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .75

HALFSTREET FLOODWIDTH(FEET) = 15.00

AVERAGE FLOW VELOCITY(FEET/SEC.) = 13.58

PRODUCT OF DEPTH&VELOCITY = 10.17

STREETFLOW TRAVELTIME(MIN) = 1.28 TC(MIN) = 18.47

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.062

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 21.56 SUBAREA RUNOFF(CFS) = 36.31

SUMMED AREA(ACRES) = 136.72 TOTAL RUNOFF(CFS) = 213.79

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .79 HALFSTREET FLOODWIDTH(FEET) = 15.00

FLOW VELOCITY(FEET/SEC.) = 13.73 DEPTH*VELOCITY = 10.81

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

- * CITY OF SANTEE
- * 100-YEAR RUNOFF
- * BASIN E

OCTOBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

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FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 7

USER CONCEIVED LOADS ARE AS FOLLOWS:

USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 20.63 RAIN INTENSITY(INCH/HOUR) = 2.75
TOTAL AREA(ACRES) = 5.00 TOTAL RUNOFF(CFS) = 7.55

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM ELEVATION = 415.00 DOWNSTREAM ELEVATION = 392.00
STREET LENGTH(FEET) = 700.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 20.00 STREET CROSSFALL(DECIMAL) = .1000
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 18.80
NOTE: STREETFLOW EXCEEDS TOP OF CURB.
THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.
STREET FLOWDEPTH(FEET) = .52
HALFSTREET FLOODWIDTH(FEET) = 5.19
AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.85
PRODUCT OF DEPTH&VELOCITY = 3.59
STREETFLOW TRAVELTIME(MIN) = 1.70 TC(MIN) = 22.33

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.609
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 15.66 SUBAREA RUNOFF(CFS) = 22.47
SUMMED AREA(ACRES) = 20.66 TOTAL RUNOFF(CFS) = 30.02
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .63 HALFSTREET FLOODWIDTH(FEET) = 6.20
FLOW VELOCITY(FEET/SEC.) = 7.70 DEPTH*VELOCITY = 4.82

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.6
UPSTREAM NODE ELEVATION = 392.00
DOWNSTREAM NODE ELEVATION = 365.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 30.02
TRAVEL TIME(MIN.) = 1.32 TC(MIN.) = 23.66

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.514
SOIL CLASSIFICATION IS "D"

BASIN_E

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 10.44 SUBAREA RUNOFF(CFS) = 14.44
 TOTAL AREA(ACRES) = 31.10 TOTAL RUNOFF(CFS) = 44.46
 TC(MIN) = 23.66

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.9 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 11.6
 UPSTREAM NODE ELEVATION = 365.00
 DOWNSTREAM NODE ELEVATION = 355.00
 FLOWLENGTH(FEET) = 600.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 44.46
 TRAVEL TIME(MIN.) = .87 TC(MIN.) = 24.52

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 =====
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.456
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 16.21
 TOTAL AREA(ACRES) = 43.10 TOTAL RUNOFF(CFS) = 60.67
 TC(MIN) = 24.52

 FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.5 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 18.8
 UPSTREAM NODE ELEVATION = 355.00
 DOWNSTREAM NODE ELEVATION = 345.00
 FLOWLENGTH(FEET) = 200.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 60.67
 TRAVEL TIME(MIN.) = .18 TC(MIN.) = 24.70

 FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

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

BASIN_E

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.445
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 5.00 SUBAREA RUNOFF(CFS) = 6.72
 TOTAL AREA(ACRES) = 48.10 TOTAL RUNOFF(CFS) = 67.39
 TC(MIN) = 24.70

 FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 15.10 RAIN INTENSITY(INCH/HOUR) = 3.36
 TOTAL AREA(ACRES) = 4.00 TOTAL RUNOFF(CFS) = 7.39

 FLOW PROCESS FROM NODE 17.00 TO NODE 20.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 385.00 DOWNSTREAM ELEVATION = 365.00
 STREET LENGTH(FEET) = 600.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 20.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 17.60
 STREET FLOWDEPTH(FEET) = .39
 HALFSTREET FLOODWIDTH(FEET) = 13.35
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.63
 PRODUCT OF DEPTH&VELOCITY = 1.82
 STREETFLOW TRAVELTIME(MIN) = 2.16 TC(MIN) = 17.26

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.081
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 12.00 SUBAREA RUNOFF(CFS) = 20.33
 SUMMED AREA(ACRES) = 16.00 TOTAL RUNOFF(CFS) = 27.72
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .44 HALFSTREET FLOODWIDTH(FEET) = 15.66
 FLOW VELOCITY(FEET/SEC.) = 5.39 DEPTH*VELOCITY = 2.37

 FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 368.00 DOWNSTREAM ELEVATION = 345.00
 STREET LENGTH(FEET) = 700.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 20.00 STREET CROSSFALL(DECIMAL) = .1000
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 34.96

NOTE: STREETFLOW EXCEEDS TOP OF CURB.
THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .65
HALFSTREET FLOODWIDTH(FEET) = 6.49
AVERAGE FLOW VELOCITY(FEET/SEC.) = 8.20
PRODUCT OF DEPTH&VELOCITY = 5.37
STREETFLOW TRAVELTIME(MIN) = 1.42 TC(MIN) = 18.68

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.927
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 9.00 SUBAREA RUNOFF(CFS) = 14.49
SUMMED AREA(ACRES) = 25.00 TOTAL RUNOFF(CFS) = 42.21
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .71 HALFSTREET FLOODWIDTH(FEET) = 7.06
FLOW VELOCITY(FEET/SEC.) = 8.36 DEPTH*VELOCITY = 5.96

FLOW PROCESS FROM NODE 26.00 TO NODE 30.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 11.22 RAIN INTENSITY(INCH/HOUR) = 4.07
TOTAL AREA(ACRES) = 3.00 TOTAL RUNOFF(CFS) = 6.71

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.00
DEPTH OF FLOW IN 24.0 INCH PIPE IS 5.5 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.4
UPSTREAM NODE ELEVATION = 455.00
DOWNSTREAM NODE ELEVATION = 395.00
FLOWLENGTH(FEET) = 800.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 6.71
TRAVEL TIME(MIN.) = 1.07 TC(MIN.) = 12.29

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.835
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

BASIN_E

SUBAREA AREA(ACRES) = 33.55 SUBAREA RUNOFF(CFS) = 70.76
 TOTAL AREA(ACRES) = 36.55 TOTAL RUNOFF(CFS) = 77.47
 TC(MIN) = 12.29

 FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.5 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 16.4
 UPSTREAM NODE ELEVATION = 395.00
 DOWNSTREAM NODE ELEVATION = 357.00
 FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 77.47
 TRAVEL TIME(MIN.) = 1.33 TC(MIN.) = 13.62

 FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.590
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 23.78 SUBAREA RUNOFF(CFS) = 46.95
 TOTAL AREA(ACRES) = 60.33 TOTAL RUNOFF(CFS) = 124.42
 TC(MIN) = 13.62

 FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 42.0 INCH PIPE IS 32.8 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 15.4
 UPSTREAM NODE ELEVATION = 357.00
 DOWNSTREAM NODE ELEVATION = 343.00
 FLOWLENGTH(FEET) = 750.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 124.42
 TRAVEL TIME(MIN.) = .81 TC(MIN.) = 14.43

 FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.458

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 2.60 SUBAREA RUNOFF(CFS) = 4.95

TOTAL AREA(ACRES) = 62.93 TOTAL RUNOFF(CFS) = 129.37

TC(MIN) = 14.43

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985-1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****
* CITY OF SANTEE *
* 100-YEAR RUNOFF *
* BASIN F *
***** SEPTEMBER 1989 *****

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE(INCH) = .24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 21.35 RAIN INTENSITY(INCH/HOUR) = 2.58
TOTAL AREA(ACRES) = 7.70 TOTAL RUNOFF(CFS) = 10.92

FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 367.00 DOWNSTREAM ELEVATION = 328.00
STREET LENGTH(FEET) = 1150.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 23.08
STREET FLOWDEPTH(FEET) = .42
HALFSTREET FLOODWIDTH(FEET) = 14.58.
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.14
PRODUCT OF DEPTH&VELOCITY = 2.15
STREETFLOW TRAVELTIME(MIN) = 3.73 TC(MIN) = 25.08

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.328

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 18.90 SUBAREA RUNOFF(CFS) = 24.20

SUMMED AREA(ACRES) = 26.60 TOTAL RUNOFF(CFS) = 35.12

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .46 HALFSTREET FLOODWIDTH(FEET) = 15.00

FLOW VELOCITY(FEET/SEC.) = 6.25 DEPTH*VELOCITY = 2.85

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 24.85 RAIN INTENSITY(INCH/HOUR) = 2.34

TOTAL AREA(ACRES) = 6.94 TOTAL RUNOFF(CFS) = 8.94

FLOW PROCESS FROM NODE 7.00 TO NODE 10.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 394.00 DOWNSTREAM ELEVATION = 383.00
STREET LENGTH(FEET) = 510.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 13.92
STREET FLOWDEPTH(FEET) = .38
HALFSTREET FLOODWIDTH(FEET) = 12.89
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.91
PRODUCT OF DEPTH&VELOCITY = 1.50
STREETFLOW TRAVELTIME(MIN) = 2.17 TC(MIN) = 27.02

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.218

SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 8.15 SUBAREA RUNOFF(CFS) = 9.94
SUMMED AREA(ACRES) = 15.09 TOTAL RUNOFF(CFS) = 18.88
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .42 HALFSTREET FLOODWIDTH(FEET) = 14.58
FLOW VELOCITY(FEET/SEC.) = 4.21 DEPTH*VELOCITY = 1.76

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 11.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.2
UPSTREAM NODE ELEVATION = 383.00
DOWNSTREAM NODE ELEVATION = 365.00
FLOWLENGTH(FEET) = 450.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 18.88
TRAVEL TIME(MIN.) = .57 TC(MIN.) = 27.59

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.189
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 11.65 SUBAREA RUNOFF(CFS) = 14.03
TOTAL AREA(ACRES) = 26.74 TOTAL RUNOFF(CFS) = 32.91
TC(MIN) = 27.59

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<

DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.2
UPSTREAM NODE ELEVATION = 365.00
DOWNSTREAM NODE ELEVATION = 325.00
FLOWLENGTH(FEET) = 1370.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 32.91
TRAVEL TIME(MIN.) = 1.73 TC(MIN.) = 29.32

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.105

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 14.05 SUBAREA RUNOFF(CFS) = 16.26

TOTAL AREA(ACRES) = 40.79 TOTAL RUNOFF(CFS) = 49.17

TC(MIN) = 29.32

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985.1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

* CITY OF SANTEE *
* 100-YEAR RUNOFF *
* BASIN G * SEPTEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

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***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

SOIL CLASSIFICATION IS VIII

SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT BIRNIE COFFEEHOUSE

NATURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.32(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00
UPSTREAM ELEVATION = 1001.00
DOWNSTREAM ELEVATION = 725.00
ELEVATION DIFFERENCE = 276.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.977
SUBAREA RUNOFF(CFS) = 22.91
TOTAL AREA(ACRES) = 12.80 TOTAL RUNOFF(CFS) = 22.91

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM NODE ELEVATION = 725.00
DOWNSTREAM NODE ELEVATION = 595.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 22.91
FLOW VELOCITY(FEET/SEC) = 8.04 FLOW DEPTH(FEET) = .48
TRAVEL TIME(MIN.) = 3.11 TC(MIN.) = 15.43

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.439
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 56.96 SUBAREA RUNOFF(CFS) = 88.16
TOTAL AREA(ACRES) = 69.76 TOTAL RUNOFF(CFS) = 111.06
TC(MIN) = 15.43

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM NODE ELEVATION = 595.00
DOWNSTREAM NODE ELEVATION = 520.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1400.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 111.06
FLOW VELOCITY(FEET/SEC) = 10.94 FLOW DEPTH(FEET) = 1.33
TRAVEL TIME(MIN.) = 2.13 TC(MIN.) = 17.56

FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.164
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 88.22 SUBAREA RUNOFF(CFS) = 125.60
TOTAL AREA(ACRES) = 157.98 TOTAL RUNOFF(CFS) = 236.66
TC(MIN) = 17.56

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 520.00
DOWNSTREAM NODE ELEVATION = 462.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1600.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 236.66
FLOW VELOCITY(FEET/SEC) = 11.65 FLOW DEPTH(FEET) = 2.17
TRAVEL TIME(MIN.) = 2.29 TC(MIN.) = 19.85

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.923
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 108.45 SUBAREA RUNOFF(CFS) = 142.67
TOTAL AREA(ACRES) = 266.43 TOTAL RUNOFF(CFS) = 379.33
TC(MIN) = 19.85

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 462.00
DOWNSTREAM NODE ELEVATION = 430.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 900.00
CHANNEL BASE(FEET) = 3.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 3.50
CHANNEL FLOW THRU SUBAREA(CFS) = 379.33
FLOW VELOCITY(FEET/SEC) = 25.86 FLOW DEPTH(FEET) = 2.28

TRAVEL TIME(MIN.) = .58 TC(MIN.) = 20.43

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.870
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 30.10 SUBAREA RUNOFF(CFS) = 47.50
TOTAL AREA(ACRES) = 296.53 TOTAL RUNOFF(CFS) = 426.83
TC(MIN) = 20.43

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====

UPSTREAM NODE ELEVATION = 430.00
DOWNSTREAM NODE ELEVATION = 390.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1150.00
CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 426.83
FLOW VELOCITY(FEET/SEC) = 25.98 FLOW DEPTH(FEET) = 2.23
TRAVEL TIME(MIN.) = .74 TC(MIN.) = 21.17

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.805
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 79.48 SUBAREA RUNOFF(CFS) = 122.60
TOTAL AREA(ACRES) = 376.01 TOTAL RUNOFF(CFS) = 549.43
TC(MIN) = 21.17

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====

UPSTREAM NODE ELEVATION = 390.00
DOWNSTREAM NODE ELEVATION = 382.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00
CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 8.00
CHANNEL FLOW THRU SUBAREA(CFS) = 549.43
FLOW VELOCITY(FEET/SEC) = 23.97 FLOW DEPTH(FEET) = 2.80
TRAVEL TIME(MIN.) = .24 TC(MIN.) = 21.41

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.784
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 7.60 SUBAREA RUNOFF(CFS) = 11.64
TOTAL AREA(ACRES) = 383.61 TOTAL RUNOFF(CFS) = 561.07
TC(MIN) = 21.41

FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 382.00
DOWNSTREAM NODE ELEVATION = 345.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1500.00
CHANNEL BASE(FEET) = 12.00 "Z" FACTOR = 1.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 561.07
FLOW VELOCITY(FEET/SEC) = 12.92 FLOW DEPTH(FEET) = 2.91
TRAVEL TIME(MIN.) = 1.93 TC(MIN.) = 23.35

FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.633
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 43.80 SUBAREA RUNOFF(CFS) = 63.43
TOTAL AREA(ACRES) = 427.41 TOTAL RUNOFF(CFS) = 624.50
TC(MIN) = 23.35

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE<<<<

DEPTH OF FLOW IN 60.0 INCH PIPE IS 34.6 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 26.6
UPSTREAM NODE ELEVATION = 345.00
DOWNSTREAM NODE ELEVATION = 335.00
FLOWLENGTH(FEET) = 250.00 MANNINGS N = .013
GIVEN PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 2
PIPEFLOW THRU SUBAREA(CFS) = 624.50
TRAVEL TIME(MIN.) = .16 TC(MIN.) = 23.50

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.622
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 23.14 SUBAREA RUNOFF(CFS) = 33.36
TOTAL AREA(ACRES) = 450.55 TOTAL RUNOFF(CFS) = 657.86
TC(MIN) = 23.50

FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 335.00
DOWNSTREAM NODE ELEVATION = 319.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1200.00
CHANNEL BASE(FEET) = 16.00 "Z" FACTOR = .000
MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 6.00
CHANNEL FLOW THRU SUBAREA(CFS) = 657.86
FLOW VELOCITY(FEET/SEC) = 18.97 FLOW DEPTH(FEET) = 2.17
TRAVEL TIME(MIN.) = 1.05 TC(MIN.) = 24.56

FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.548
SOIL CLASSIFICATION IS "D"
MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000
SUBAREA AREA(ACRES) = 29.80 SUBAREA RUNOFF(CFS) = 53.16
TOTAL AREA(ACRES) = 480.35 TOTAL RUNOFF(CFS) = 711.02
TC(MIN) = 24.56

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****
* CITY OF SANTEE *
* 100-YEAR RUNOFF *
* BASIN H * SEPTEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

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SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.59(MINUTES)
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 500.00
 UPSTREAM ELEVATION = 651.00
 DOWNSTREAM ELEVATION = 525.00
 ELEVATION DIFFERENCE = 126.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.983
 SUBAREA RUNOFF(CFS) = 4.66
 TOTAL AREA(ACRES) = 2.60 TOTAL RUNOFF(CFS) = 4.66

 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 525.00
 DOWNSTREAM NODE ELEVATION = 465.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 550.00
 CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 4.66
 FLOW VELOCITY(FEET/SEC) = 6.36 FLOW DEPTH(FEET) = .61
 TRAVEL TIME(MIN.) = 1.44 TC(MIN.) = 13.03

 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.693
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SUBAREA AREA(ACRES) = 19.00 SUBAREA RUNOFF(CFS) = 31.57
 TOTAL AREA(ACRES) = 21.60 TOTAL RUNOFF(CFS) = 36.23
 TC(MIN) = 13.03

 FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 465.00 DOWNSTREAM ELEVATION = 438.00
 STREET LENGTH(FEET) = 450.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 20.00 STREET CROSSFALL(DECIMAL) = .1000
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 51.56
 NOTE: STREETFLOW EXCEEDS TOP OF CURB.

THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
 THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
 THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .68
 HALFSTREET FLOODWIDTH(FEET) = 6.78

AVERAGE FLOW VELOCITY(FEET/SEC.) = 11.10
 PRODUCT OF DEPTH&VELOCITY = 7.59
 STREETFLOW TRAVELTIME(MIN) = .68 TC(MIN) = 13.71

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.574
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 15.59 SUBAREA RUNOFF(CFS) = 30.65
 SUMMED AREA(ACRES) = 37.19 TOTAL RUNOFF(CFS) = 66.88
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .76 HALFWAY FLOODWIDTH(FEET) = 7.50
 FLOW VELOCITY(FEET/SEC.) = 11.78 DEPTH*VELOCITY = 8.91

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<

 DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.2 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 20.9
 UPSTREAM NODE ELEVATION = 438.00
 DOWNSTREAM NODE ELEVATION = 335.00
 FLOWLENGTH(FEET) = 1650.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 66.88
 TRAVEL TIME(MIN.) = 1.31 TC(MIN.) = 15.02

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

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

 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.369
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 57.67 SUBAREA RUNOFF(CFS) = 106.87
 TOTAL AREA(ACRES) = 94.86 TOTAL RUNOFF(CFS) = 173.76
 TC(MIN) = 15.02

 FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
 >>>>TRAVELTIME THRU SUBAREA<<<

 UPSTREAM NODE ELEVATION = 335.00
 DOWNSTREAM NODE ELEVATION = 322.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1450.00
 CHANNEL BASE(FEET) = 6.00 "Z" FACTOR = .000
 MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 5.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 173.76

FLOW VELOCITY(FEET/SEC) = 12.89 FLOW DEPTH(FEET) = 2.25
TRAVEL TIME(MIN.) = 1.87 TC(MIN.) = 16.90

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

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

=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.123
SOIL CLASSIFICATION IS "D"
MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000
SUBAREA AREA(ACRES) = 20.30 SUBAREA RUNOFF(CFS) = 44.38
TOTAL AREA(ACRES) = 115.16 TOTAL RUNOFF(CFS) = 218.14
TC(MIN) = 16.90
=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL.

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Especi ally prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN I

SEPTEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .80

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.76(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00
UPSTREAM ELEVATION = 650.00
DOWNSTREAM ELEVATION = 475.00
ELEVATION DIFFERENCE = 175.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.743
SUBAREA RUNOFF(CFS) = 11.79
TOTAL AREA(ACRES) = 7.00 TOTAL RUNOFF(CFS) = 11.79

FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 475.00
DOWNSTREAM NODE ELEVATION = 450.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 11.79
FLOW VELOCITY(FEET/SEC) = 5.13 FLOW DEPTH(FEET) = .40
TRAVEL TIME(MIN.) = 1.95 TC(MIN.) = 14.71

FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.415
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 1.99 SUBAREA RUNOFF(CFS) = 3.74
TOTAL AREA(ACRES) = 8.99 TOTAL RUNOFF(CFS) = 15.53
TC(MIN) = 14.71

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 450.00
DOWNSTREAM NODE ELEVATION = 335.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 15.53
FLOW VELOCITY(FEET/SEC) = 6.27 FLOW DEPTH(FEET) = .42
TRAVEL TIME(MIN.) = 5.32 TC(MIN.) = 20.03

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.799
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 31.52 SUBAREA RUNOFF(CFS) = 48.52
TOTAL AREA(ACRES) = 40.51 TOTAL RUNOFF(CFS) = 64.05
TC(MIN) = 20.03

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.18(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 750.00
UPSTREAM ELEVATION = 671.50
DOWNSTREAM ELEVATION = 485.00
ELEVATION DIFFERENCE = 186.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.857
SUBAREA RUNOFF(CFS) = 8.68
TOTAL AREA(ACRES) = 5.00 TOTAL RUNOFF(CFS) = 8.68

FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 485.00
DOWNSTREAM NODE ELEVATION = 480.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 8.68
FLOW VELOCITY(FEET/SEC) = 3.26 FLOW DEPTH(FEET) = .45
TRAVEL TIME(MIN.) = 1.79 TC(MIN.) = 13.97

FLOW PROCESS FROM NODE 12.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.530
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 8.00 SUBAREA RUNOFF(CFS) = 12.71
TOTAL AREA(ACRES) = 13.00 TOTAL RUNOFF(CFS) = 21.39
TC(MIN) = 13.97

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 11.2 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.8
UPSTREAM NODE ELEVATION = 480.00
DOWNSTREAM NODE ELEVATION = 400.00
FLOWLENGTH(FEET) = 1600.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 21.39
TRAVEL TIME(MIN.) = 1.80 TC(MIN.) = 15.77

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.265
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 25.00 SUBAREA RUNOFF(CFS) = 36.73
TOTAL AREA(ACRES) = 38.00 TOTAL RUNOFF(CFS) = 58.12
TC(MIN) = 15.77

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.0
UPSTREAM NODE ELEVATION = 400.00
DOWNSTREAM NODE ELEVATION = 377.00
FLOWLENGTH(FEET) = 700.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 58.12
TRAVEL TIME(MIN.) = .73 TC(MIN.) = 16.50

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

```
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.172
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 17.45 SUBAREA RUNOFF(CFS) = 24.91
TOTAL AREA(ACRES) = 55.45 TOTAL RUNOFF(CFS) = 83.03
TC(MIN) = 16.50
```

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*****
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 5
```

```
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
```

```
=====
UPSTREAM NODE ELEVATION = 377.00
DOWNSTREAM NODE ELEVATION = 335.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 2000.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 83.03
FLOW VELOCITY(FEET/SEC) = 7.16 FLOW DEPTH(FEET) = 1.46
TRAVEL TIME(MIN.) = 4.65 TC(MIN.) = 21.15
```

```
*****
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8
```

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

```
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.702
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 61.07 SUBAREA RUNOFF(CFS) = 90.76
TOTAL AREA(ACRES) = 116.52 TOTAL RUNOFF(CFS) = 173.78
TC(MIN) = 21.15
```

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=====
END OF RATIONAL METHOD ANALYSIS
```


RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN J

NOVEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.77(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
UPSTREAM ELEVATION = 985.00
DOWNSTREAM ELEVATION = 725.00
ELEVATION DIFFERENCE = 260.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.943
SUBAREA RUNOFF(CFS) = 8.87
TOTAL AREA(ACRES) = 5.00 TOTAL RUNOFF(CFS) = 8.87

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 725.00
DOWNSTREAM NODE ELEVATION = 575.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1150.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 8.87
FLOW VELOCITY(FEET/SEC) = 6.19 FLOW DEPTH(FEET) = .26
TRAVEL TIME(MIN.) = 3.10 TC(MIN.) = 14.87

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.391
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 30.00 SUBAREA RUNOFF(CFS) = 45.78
TOTAL AREA(ACRES) = 35.00 TOTAL RUNOFF(CFS) = 54.65
TC(MIN) = 14.87

FLOW PROCESS FROM NODE 3.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 575.00
DOWNSTREAM NODE ELEVATION = 490.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 54.65
FLOW VELOCITY(FEET/SEC) = 9.44 FLOW DEPTH(FEET) = .86
TRAVEL TIME(MIN.) = 2.38 TC(MIN.) = 17.26

FLOW PROCESS FROM NODE 3.00 TO NODE 10.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.081

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 46.70 SUBAREA RUNOFF(CFS) = 64.75

TOTAL AREA(ACRES) = 81.70 TOTAL RUNOFF(CFS) = 119.41

TC(MIN) = 17.26

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.7 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 19.0

UPSTREAM NODE ELEVATION = 490.00

DOWNTSTREAM NODE ELEVATION = 450.00

FLOWLENGTH(FEET) = 1250.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 119.41

TRAVEL TIME(MIN.) = 1.10 TC(MIN.) = 18.35

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.961

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 27.56 SUBAREA RUNOFF(CFS) = 44.88

TOTAL AREA(ACRES) = 109.26 TOTAL RUNOFF(CFS) = 164.29

TC(MIN) = 18.35

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.6 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 18.6

UPSTREAM NODE ELEVATION = 450.00

DOWNTSTREAM NODE ELEVATION = 405.00

FLOWLENGTH(FEET) = 1800.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 164.29

TRAVEL TIME(MIN.) = 1.61 TC(MIN.) = 19.97

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.804

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 46.00 SUBAREA RUNOFF(CFS) = 70.95

TOTAL AREA(ACRES) = 155.26 TOTAL RUNOFF(CFS) = 235.24

TC(MIN) = 19.97

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE<<<<

DEPTH OF FLOW IN 54.0 INCH PIPE IS 34.8 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 21.7

UPSTREAM NODE ELEVATION = 405.00

DOWNSHIFT NODE ELEVATION = 395.00

FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013

GIVEN PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 235.24

TRAVEL TIME(MIN.) = .27 TC(MIN.) = 20.24

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.780

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 49.90 SUBAREA RUNOFF(CFS) = 76.31

TOTAL AREA(ACRES) = 205.16 TOTAL RUNOFF(CFS) = 311.55

TC(MIN) = 20.24

FLOW PROCESS FROM NODE 29.00 TO NODE 30.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.35(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00

UPSTREAM ELEVATION = 671.50
DOWNSTREAM ELEVATION = 485.00
ELEVATION DIFFERENCE = 186.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.823
SUBAREA RUNOFF(CFS) = 27.33
TOTAL AREA(ACRES) = 13.00 TOTAL RUNOFF(CFS) = 27.33

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 13.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.7
UPSTREAM NODE ELEVATION = 485.00
DOWNSTREAM NODE ELEVATION = 410.00
FLOWLENGTH(FEET) = 1800.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 27.33
TRAVEL TIME(MIN.) = 2.04 TC(MIN.) = 14.39

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8

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

=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.464
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 25.80 SUBAREA RUNOFF(CFS) = 49.15
TOTAL AREA(ACRES) = 38.80 TOTAL RUNOFF(CFS) = 76.48
TC(MIN) = 14.39

FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

=====
UPSTREAM NODE ELEVATION = 410.00
DOWNSTREAM NODE ELEVATION = 381.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 5.00
CHANNEL FLOW THRU SUBAREA(CFS) = 76.48
FLOW VELOCITY(FEET/SEC) = 8.14 FLOW DEPTH(FEET) = 2.17
TRAVEL TIME(MIN.) = 2.05 TC(MIN.) = 16.44

FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.179

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 9.64 SUBAREA RUNOFF(CFS) = 16.85

TOTAL AREA(ACRES) = 48.44 TOTAL RUNOFF(CFS) = 93.34

TC(MIN) = 16.44

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 381.00

DOWNTSTREAM NODE ELEVATION = 365.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 500.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 5.00

CHANNEL FLOW THRU SUBAREA(CFS) = 93.34

FLOW VELOCITY(FEET/SEC) = 8.94 FLOW DEPTH(FEET) = 2.29

TRAVEL TIME(MIN.) = .93 TC(MIN.) = 17.37

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.068

SOIL CLASSIFICATION IS "D"

INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500

SUBAREA AREA(ACRES) = 6.00 SUBAREA RUNOFF(CFS) = 17.49

TOTAL AREA(ACRES) = 54.44 TOTAL RUNOFF(CFS) = 110.82

TC(MIN) = 17.37

=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

- * CITY OF SANTEE
- * 100-YEAR RUNOFF
- * BASIN K

NOVEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.800

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

ANALYTICAL METHOD INITIAL SUBAREA ANALYSIS <<<<

>>>>RATIONAL METHOD INITIAL SUBAREA FLOW

SOCIAL CLASSIFICATION IS "D"

SOIL CLASSIFICATION IS D
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

BASIN_K

WITH 10-MINUTES ADDED = 12.86(MINUTES)
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00
 UPSTREAM ELEVATION = 1160.00
 DOWNSTREAM ELEVATION = 1000.00
 ELEVATION DIFFERENCE = 160.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.011
 SUBAREA RUNOFF(CFS) = 20.40
 TOTAL AREA(ACRES) = 11.30 TOTAL RUNOFF(CFS) = 20.40

 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

 >>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<
 ======
 UPSTREAM NODE ELEVATION = 1000.00
 DOWNSTREAM NODE ELEVATION = 800.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 2300.00
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 20.40
 FLOW VELOCITY(FEET/SEC) = 7.66 FLOW DEPTH(FEET) = .45
 TRAVEL TIME(MIN.) = 5.00 TC(MIN.) = 17.86

 FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 ======
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.245
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SUBAREA AREA(ACRES) = 77.50 SUBAREA RUNOFF(CFS) = 113.17
 TOTAL AREA(ACRES) = 88.80 TOTAL RUNOFF(CFS) = 133.57
 TC(MIN) = 17.86

 FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 5

 >>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<
 ======
 UPSTREAM NODE ELEVATION = 800.00
 DOWNSTREAM NODE ELEVATION = 565.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1900.00
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 133.57
 FLOW VELOCITY(FEET/SEC) = 15.69 FLOW DEPTH(FEET) = 1.16
 TRAVEL TIME(MIN.) = 2.02 TC(MIN.) = 19.88

FLOW PROCESS FROM NODE 3.00 TO NODE 4.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.029

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 69.80 SUBAREA RUNOFF(CFS) = 95.13

TOTAL AREA(ACRES) = 158.60 TOTAL RUNOFF(CFS) = 228.69

TC(MIN) = 19.88

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 565.00

DOWNTSTREAM NODE ELEVATION = 475.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 2200.00

CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00

CHANNEL FLOW THRU SUBAREA(CFS) = 228.69

FLOW VELOCITY(FEET/SEC) = 12.13 FLOW DEPTH(FEET) = 2.06

TRAVEL TIME(MIN.) = 3.02 TC(MIN.) = 22.90

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 8

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.764

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 230.00 SUBAREA RUNOFF(CFS) = 286.11

TOTAL AREA(ACRES) = 388.60 TOTAL RUNOFF(CFS) = 514.81

TC(MIN) = 22.90

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 1

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

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

=====

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 22.90

RAINFALL INTENSITY (INCH./HOUR) = 2.76

TOTAL STREAM AREA (ACRES) = 388.60

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 514.81

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	514.81	22.90	2.764

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 1 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

514.81
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 $\text{RUNOFF(CFS)} = 514.81 \quad \text{TIME(MINUTES)} = 22.903$
 $\text{TOTAL AREA(ACRES)} = 388.60$

 FLOW PROCESS FROM NODE 100.00 TO NODE 110.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
 WITH 10-MINUTES ADDED = 11.71(MINUTES)
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
 UPSTREAM ELEVATION = 1188.00
 DOWNSTREAM ELEVATION = 900.00
 ELEVATION DIFFERENCE = 288.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.262
 $\text{SUBAREA RUNOFF(CFS)} = 13.23$
 $\text{TOTAL AREA(ACRES)} = 6.90 \quad \text{TOTAL RUNOFF(CFS)} = 13.23$

 FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 900.00
 DOWNSTREAM NODE ELEVATION = 625.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00
 $\text{CHANNEL BASE(FEET)} = 5.00 \quad \text{"Z" FACTOR} = 2.000$
 $\text{MANNINGS FACTOR} = .030 \quad \text{MAXIMUM DEPTH(FEET)} = 7.00$
 $\text{CHANNEL FLOW THRU SUBAREA(CFS)} = 13.23$
 $\text{FLOW VELOCITY(FEET/SEC)} = 8.27 \quad \text{FLOW DEPTH(FEET)} = .29$
 $\text{TRAVEL TIME(MIN.)} = 3.43 \quad \text{TC(MIN.)} = 15.13$

 FLOW PROCESS FROM NODE 110.00 TO NODE 120.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.612
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 85.40 SUBAREA RUNOFF(CFS) = 138.79
TOTAL AREA(ACRES) = 92.30 TOTAL RUNOFF(CFS) = 152.03
TC(MIN) = 15.13

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 625.00
DOWNSTREAM NODE ELEVATION = 535.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 152.03
FLOW VELOCITY(FEET/SEC) = 11.77 FLOW DEPTH(FEET) = 1.58
TRAVEL TIME(MIN.) = 2.41 TC(MIN.) = 17.54

FLOW PROCESS FROM NODE 120.00 TO NODE 130.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.284
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 37.60 SUBAREA RUNOFF(CFS) = 55.56
TOTAL AREA(ACRES) = 129.90 TOTAL RUNOFF(CFS) = 207.58
TC(MIN) = 17.54

FLOW PROCESS FROM NODE 130.00 TO NODE 5.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE<<<<

DEPTH OF FLOW IN 54.0 INCH PIPE IS 29.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 23.5
UPSTREAM NODE ELEVATION = 535.00
DOWNSTREAM NODE ELEVATION = 475.00
FLOWLENGTH(FEET) = 1600.00 MANNINGS N = .013
GIVEN PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 207.58
TRAVEL TIME(MIN.) = 1.13 TC(MIN.) = 18.67

FLOW PROCESS FROM NODE 130.00 TO NODE 5.00 IS CODE = 1

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

=====
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MINUTES) = 18.67
 RAINFALL INTENSITY (INCH./HOUR) = 3.15
 TOTAL STREAM AREA (ACRES) = 129.90
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 207.58

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
---------------	--------------	-------------	-----------------------

1	514.81	22.90	2.764
2	207.58	18.67	3.153

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

696.78 658.88

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 696.78 TIME(MINUTES) = 22.903
 TOTAL AREA(ACRES) = 518.50

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
 >>>>TRAVELTIME THRU SUBAREA<<<

UPSTREAM NODE ELEVATION = 475.00
 DOWNSTREAM NODE ELEVATION = 460.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 750.00
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 696.78
 FLOW VELOCITY(FEET/SEC) = 12.39 FLOW DEPTH(FEET) = 4.20
 TRAVEL TIME(MIN.) = 1.01 TC(MIN.) = 23.91

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.689
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 56.00 SUBAREA RUNOFF(CFS) = 82.81
 TOTAL AREA(ACRES) = 574.50 TOTAL RUNOFF(CFS) = 779.59
 TC(MIN) = 23.91

 FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

```
=====
UPSTREAM NODE ELEVATION = 460.00
DOWNSTREAM NODE ELEVATION = 450.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 750.00
CHANNEL BASE(FEET) = 7.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 7.00
CHANNEL FLOW THRU SUBAREA(CFS) = 779.59
FLOW VELOCITY(FEET/SEC) = 10.94 FLOW DEPTH(FEET) = 4.47
TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 25.05
```

```
*****
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8
```

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

```
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.609
SOIL CLASSIFICATION IS "D"
MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000
SUBAREA AREA(ACRES) = 146.50 SUBAREA RUNOFF(CFS) = 267.54
TOTAL AREA(ACRES) = 721.00 TOTAL RUNOFF(CFS) = 1047.13
TC(MIN) = 25.05
```

```
*****
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 5
```

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

```
=====
UPSTREAM NODE ELEVATION = 450.00
DOWNSTREAM NODE ELEVATION = 420.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00
CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 1.500
MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 4.50
CHANNEL FLOW THRU SUBAREA(CFS) = 1047.13
FLOW VELOCITY(FEET/SEC) = 31.38 FLOW DEPTH(FEET) = 3.57
TRAVEL TIME(MIN.) = .53 TC(MIN.) = 25.59
```

```
*****
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8
```

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

```
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.574
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 97.06 SUBAREA RUNOFF(CFS) = 137.40
TOTAL AREA(ACRES) = 818.06 TOTAL RUNOFF(CFS) = 1184.53
TC(MIN) = 25.59
```

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*****
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FLOW PROCESS FROM NODE 20.00 TO NODE 30.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 420.00

DOWNTSTREAM NODE ELEVATION = 400.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1250.00

CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 6.00

CHANNEL FLOW THRU SUBAREA(CFS) = 1184.53

FLOW VELOCITY(FEET/SEC) = 25.03 FLOW DEPTH(FEET) = 3.55

TRAVEL TIME(MIN.) = .83 TC(MIN.) = 26.42

FLOW PROCESS FROM NODE 20.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.521

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 56.50 SUBAREA RUNOFF(CFS) = 78.35

TOTAL AREA(ACRES) = 874.56 TOTAL RUNOFF(CFS) = 1262.87

TC(MIN) = 26.42

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 400.00

DOWNTSTREAM NODE ELEVATION = 375.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1900.00

CHANNEL BASE(FEET) = 8.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 6.00

CHANNEL FLOW THRU SUBAREA(CFS) = 1262.87

FLOW VELOCITY(FEET/SEC) = 23.76 FLOW DEPTH(FEET) = 3.86

TRAVEL TIME(MIN.) = 1.33 TC(MIN.) = 27.75

FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.442

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 41.00 SUBAREA RUNOFF(CFS) = 55.08

TOTAL AREA(ACRES) = 915.56 TOTAL RUNOFF(CFS) = 1317.95

TC(MIN) = 27.75

FLOW PROCESS FROM NODE 35.00 TO NODE 35.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 27.75
RAINFALL INTENSITY (INCH./HOUR) = 2.44
TOTAL STREAM AREA (ACRES) = 915.56
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 1317.95

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
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1	1317.95	27.75	2.442
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RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 1 STREAMS
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

1317.95

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 1317.95 TIME(MINUTES) = 27.750

TOTAL AREA(ACRES) = 915.56

FLOW PROCESS FROM NODE 250.00 TO NODE 35.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<
=====
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 20.24 RAIN INTENSITY(INCH/HOUR) = 2.99
TOTAL AREA(ACRES) = 205.16 TOTAL RUNOFF(CFS) = 311.55

FLOW PROCESS FROM NODE 35.00 TO NODE 35.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 20.24
RAINFALL INTENSITY (INCH./HOUR) = 2.99
TOTAL STREAM AREA (ACRES) = 205.16
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 311.55

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
---------------	--------------	-------------	-----------------------

1	1317.95	27.75	2.442
---	---------	-------	-------

2 311.55 20.24 2.994

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

1572.12 1386.77

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 1572.12 TIME(MINUTES) = 27.750

TOTAL AREA(ACRES) = 1120.72

FLOW PROCESS FROM NODE 35.00 TO NODE 36.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 375.00

DOWNSHIFT NODE ELEVATION = 367.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 550.00

CHANNEL BASE(FEET) = 14.00 "Z" FACTOR = 1.500

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.00

CHANNEL FLOW THRU SUBAREA(CFS) = 1572.12

FLOW VELOCITY(FEET/SEC) = 22.53 FLOW DEPTH(FEET) = 3.60

TRAVEL TIME(MIN.) = .41 TC(MIN.) = 28.16

FLOW PROCESS FROM NODE 35.00 TO NODE 36.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.420

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 25.00 SUBAREA RUNOFF(CFS) = 33.27

TOTAL AREA(ACRES) = 1145.72 TOTAL RUNOFF(CFS) = 1605.39

TC(MIN) = 28.16

FLOW PROCESS FROM NODE 36.00 TO NODE 36.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 28.16

RAINFALL INTENSITY (INCH./HOUR) = 2.42

TOTAL STREAM AREA (ACRES) = 1145.72

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 1605.39

FLOW PROCESS FROM NODE 450.00 TO NODE 36.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 17.37 RAIN INTENSITY(INCH/HOUR) = 3.30
 TOTAL AREA(ACRES) = 54.44 TOTAL RUNOFF(CFS) = 110.82

 FLOW PROCESS FROM NODE 36.00 TO NODE 36.00 IS CODE = 1

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

===== CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 17.37
 RAINFALL INTENSITY (INCH./HOUR) = 3.30
 TOTAL STREAM AREA (ACRES) = 54.44
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 110.82

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
---------------	--------------	-------------	-----------------------

1	1605.39	28.16	2.420
2	110.82	17.37	3.304

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

1686.54 1286.44

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 1686.54 TIME(MINUTES) = 28.157
 TOTAL AREA(ACRES) = 1200.16

 FLOW PROCESS FROM NODE 36.00 TO NODE 40.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<

===== UPSTREAM NODE ELEVATION = 367.00
 DOWNSTREAM NODE ELEVATION = 360.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 550.00
 CHANNEL BASE(FEET) = 14.00 "Z" FACTOR = 1.500
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 6.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 1686.54
 FLOW VELOCITY(FEET/SEC) = 21.94 FLOW DEPTH(FEET) = 3.88
 TRAVEL TIME(MIN.) = .42 TC(MIN.) = 28.58

 FLOW PROCESS FROM NODE 36.00 TO NODE 40.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.397

SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = .25.00 SUBAREA RUNOFF(CFS) = 32.96
TOTAL AREA(ACRES) = 1225.16 TOTAL RUNOFF(CFS) = 1719.50
TC(MIN.) = 28.58

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM NODE ELEVATION = 360.00
DOWNSTREAM NODE ELEVATION = 346.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 950.00
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1719.50
FLOW VELOCITY(FEET/SEC) = 13.87 FLOW DEPTH(FEET) = 5.76
TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 29.72

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.337
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 37.60 SUBAREA RUNOFF(CFS) = 39.54
TOTAL AREA(ACRES) = 1262.76 TOTAL RUNOFF(CFS) = 1759.04
TC(MIN.) = 29.72

FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM NODE ELEVATION = 346.00
DOWNSTREAM NODE ELEVATION = 330.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1700.00
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 1759.04
FLOW VELOCITY(FEET/SEC) = 11.31 FLOW DEPTH(FEET) = 5.14
TRAVEL TIME(MIN.) = 2.50 TC(MIN.) = 32.22

FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.218

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 41.00 SUBAREA RUNOFF(CFS) = 40.92

TOTAL AREA(ACRES) = 1303.76 TOTAL RUNOFF(CFS) = 1799.96

TC(MIN) = 32.22

===== END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****
* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN L

JANUARY 1990

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

ANALYTICAL METHOD INITIAL SUBAREA ANALYSIS <<<<

SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 13.40(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1300.00
UPSTREAM ELEVATION = 807.00
DOWNSTREAM ELEVATION = 500.00
ELEVATION DIFFERENCE = 307.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.766
SUBAREA RUNOFF(CFS) = 9.81
TOTAL AREA(ACRES) = 5.79 TOTAL RUNOFF(CFS) = 9.81

FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 500.00 DOWNSTREAM ELEVATION = 445.00
STREET LENGTH(FEET) = 1250.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 30.47
STREET FLOWING FULL
STREET FLOWDEPTH(FEET) = .44
HALFSTREET FLOODWIDTH(FEET) = 15.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.06
PRODUCT OF DEPTH&VELOCITY = 2.64
STREETFLOW TRAVELTIME(MIN) = 3.44 TC(MIN) = 16.84

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.250
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 22.90 SUBAREA RUNOFF(CFS) = 40.94
SUMMED AREA(ACRES) = 28.69 TOTAL RUNOFF(CFS) = 50.75
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .49 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 7.48 DEPTH*VELOCITY = 3.70

FLOW PROCESS FROM NODE 3.00 TO NODE 10.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 445.00 DOWNSTREAM ELEVATION = 410.00
STREET LENGTH(FEET) = 1300.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 71.66
STREET FLOWING FULL
NOTE: STREETFLOW EXCEEDS TOP OF CURB.
THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.
STREET FLOWDEPTH(FEET) = .57
HALFSTREET FLOODWIDTH(FEET) = 15.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 7.85

PRODUCT OF DEPTH&VELOCITY = 4.50
STREETFLOW TRAVELTIME(MIN) = 2.76 TC(MIN) = 19.60

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.947

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 25.74 SUBAREA RUNOFF(CFS) = 41.72

SUMMED AREA(ACRES) = 54.43 TOTAL RUNOFF(CFS) = 92.48

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .63 HALFSTREET FLOODWIDTH(FEET) = 15.00

FLOW VELOCITY(FEET/SEC.) = 8.49 DEPTH*VELOCITY = 5.36

FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1

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

===== CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 19.60

RAINFALL INTENSITY (INCH./HOUR) = 2.95

TOTAL STREAM AREA (ACRES) = 54.43

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 92.48

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

===== USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 16.70 RAIN INTENSITY(INCH/HOUR) = 3.27

TOTAL AREA(ACRES) = 6.22 TOTAL RUNOFF(CFS) = 11.18

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

===== UPSTREAM ELEVATION = 469.00 DOWNSTREAM ELEVATION = 450.00

STREET LENGTH(FEET) = 630.00 CURB HEIGHT(INCHES) = 6.

STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 19.44

STREET FLOWDEPTH(FEET) = .40

HALFSTREET FLOODWIDTH(FEET) = 13.73

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.85

PRODUCT OF DEPTH&VELOCITY = 1.94

STREETFLOW TRAVELTIME(MIN) = 2.17 TC(MIN) = 18.87

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.021

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 9.92 SUBAREA RUNOFF(CFS) = 16.48

SUMMED AREA(ACRES) = 16.14 TOTAL RUNOFF(CFS) = 27.66
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .44 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 5.50 DEPTH*VELOCITY = 2.40

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.0
UPSTREAM NODE ELEVATION = 450.00
DOWNSTREAM NODE ELEVATION = 429.00
FLOWLENGTH(FEET) = 700.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 27.66
TRAVEL TIME(MIN.) = .90 TC(MIN.) = 19.77

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.931
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 11.70 SUBAREA RUNOFF(CFS) = 18.86
TOTAL AREA(ACRES) = 27.84 TOTAL RUNOFF(CFS) = 46.53
TC(MIN) = 19.77

FLOW PROCESS FROM NODE 7.00 TO NODE 10.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.7
UPSTREAM NODE ELEVATION = 429.00
DOWNSTREAM NODE ELEVATION = 410.00
FLOWLENGTH(FEET) = 770.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 46.53
TRAVEL TIME(MIN.) = .94 TC(MIN.) = 20.70

FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1

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

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MINUTES) = 20.70
RAINFALL INTENSITY (INCH./HOUR) = 2.85
TOTAL STREAM AREA (ACRES) = 27.84
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 46.53

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	92.48	19.60	2.947
2	46.53	20.70	2.845

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

137.39 135.80
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
RUNOFF(CFS) = 137.39 TIME(MINUTES) = 19.601
TOTAL AREA(ACRES) = 82.27

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 45.0 INCH PIPE IS 31.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.5
UPSTREAM NODE ELEVATION = 410.00
DOWNSTREAM NODE ELEVATION = 383.00
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 137.39
TRAVEL TIME(MIN.) = 1.37 TC(MIN.) = 20.97

FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.822
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 38.00 SUBAREA RUNOFF(CFS) = 58.98
TOTAL AREA(ACRES) = 120.27 TOTAL RUNOFF(CFS) = 196.37
TC(MIN) = 20.97

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

```
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 51.0 INCH PIPE IS 41.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.1
UPSTREAM NODE ELEVATION = 383.00
DOWNSTREAM NODE ELEVATION = 362.00
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 196.37
TRAVEL TIME(MIN.) = 1.40 TC(MIN.) = 22.37

*****
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.707
SOIL CLASSIFICATION IS "D"
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 41.41
TOTAL AREA(ACRES) = 138.27 TOTAL RUNOFF(CFS) = 237.78
TC(MIN.) = 22.37

*****
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 60.0 INCH PIPE IS 43.6 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.5
UPSTREAM NODE ELEVATION = 362.00
DOWNSTREAM NODE ELEVATION = 350.00
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 60.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 237.78
TRAVEL TIME(MIN.) = 1.07 TC(MIN.) = 23.44

*****
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.626
SOIL CLASSIFICATION IS "D"
MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000
SUBAREA AREA(ACRES) = 29.73 SUBAREA RUNOFF(CFS) = 54.65
TOTAL AREA(ACRES) = 168.00 TOTAL RUNOFF(CFS) = 292.44
TC(MIN) = 23.44
```

```
*****  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 3  
-----  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====  
DEPTH OF FLOW IN 72.0 INCH PIPE IS 57.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 12.1  
UPSTREAM NODE ELEVATION = 350.00  
DOWNSTREAM NODE ELEVATION = 345.00  
FLOWLENGTH(FEET) = 900.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 292.44  
TRAVEL TIME(MIN.) = 1.24 TC(MIN.) = 24.68  
*****  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.540  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 21.41 SUBAREA RUNOFF(CFS) = 29.91  
TOTAL AREA(ACRES) = 189.41 TOTAL RUNOFF(CFS) = 322.35  
TC(MIN) = 24.68  
*****  
FLOW PROCESS FROM NODE 31.00 TO NODE 35.00 IS CODE = 7  
-----  
>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<  
=====  
USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 16.07 RAIN INTENSITY(INCH/HOUR) = 3.35  
TOTAL AREA(ACRES) = 12.12 TOTAL RUNOFF(CFS) = 22.33  
*****  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 5  
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>>TRAVELTIME THRU SUBAREA<<<  
=====  
UPSTREAM NODE ELEVATION = 420.00  
DOWNSTREAM NODE ELEVATION = 397.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 950.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 22.33  
FLOW VELOCITY(FEET/SEC) = 4.94 FLOW DEPTH(FEET) = 1.50  
TRAVEL TIME(MIN.) = 3.21 TC(MIN.) = 19.28
```

FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.979

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 13.68 SUBAREA RUNOFF(CFS) = 22.41

TOTAL AREA(ACRES) = 25.80 TOTAL RUNOFF(CFS) = 44.74

TC(MIN) = 19.28

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 30.0 INCH PIPE IS 21.9 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 11.6

UPSTREAM NODE ELEVATION = 397.00

DOWNSTREAM NODE ELEVATION = 375.00

FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 44.74

TRAVEL TIME(MIN.) = 1.86 TC(MIN.) = 21.14

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.807

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 20.20 SUBAREA RUNOFF(CFS) = 31.19

TOTAL AREA(ACRES) = 46.00 TOTAL RUNOFF(CFS) = 75.93

TC(MIN) = 21.14

FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.4 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 13.2

UPSTREAM NODE ELEVATION = 375.00

DOWNSTREAM NODE ELEVATION = 354.00

FLOWLENGTH(FEET) = 1250.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 75.93

TRAVEL TIME(MIN.) = 1.58 TC(MIN.) = 22.72

FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.679

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 17.50 SUBAREA RUNOFF(CFS) = 25.79

TOTAL AREA(ACRES) = 63.50 TOTAL RUNOFF(CFS) = 101.72

TC(MIN) = 22.72

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:
JEWELL
BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****
* CITY OF SANTEE *
* 100-YEAR RUNOFF *
* BASIN M *
***** SEPTEMBER 1989 *

***** SPENT *****

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE - 1.00 TO NODE 5.00 IS CODE = 7

>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 12.88 RAIN INTENSITY(INCH/HOUR) = 3.86
TOTAL AREA(ACRES) = 9.91 TOTAL RUNOFF(CFS) = 21.06

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<
>>>>TRAVELTIME THRU SUBAREA<<<
=====
UPSTREAM NODE ELEVATION = 431.00
DOWNSTREAM NODE ELEVATION = 392.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 21.06
FLOW VELOCITY(FEET/SEC) = 5.18 FLOW DEPTH(FEET) = 1.43
TRAVEL TIME(MIN.) = 4.34 TC(MIN.) = 17.22

FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.204
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 21.67 SUBAREA RUNOFF(CFS) = 38.18
TOTAL AREA(ACRES) = 31.58 TOTAL RUNOFF(CFS) = 59.24
TC(MIN) = 17.22

FLOW PROCESS FROM NODE 10.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.7 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 13.6
UPSTREAM NODE ELEVATION = 392.00
DOWNSTREAM NODE ELEVATION = 365.00
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 59.24
TRAVEL TIME(MIN.) = 1.60 TC(MIN.) = 18.82

FLOW PROCESS FROM NODE 10.00 TO NODE 20.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.026
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 36.23 SUBAREA RUNOFF(CFS) = 60.29
TOTAL AREA(ACRES) = 67.81 TOTAL RUNOFF(CFS) = 119.53
TC(MIN) = 18.82

FLOW PROCESS FROM NODE 20.00 TO NODE 20.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.82
RAINFALL INTENSITY (INCH./HOUR) = 3.03
TOTAL STREAM AREA (ACRES) = 67.81
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 119.53

FLOW PROCESS FROM NODE 15.00 TO NODE 16.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 16.22(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1450.00
UPSTREAM ELEVATION = 472.00
DOWNSTREAM ELEVATION = 383.00
ELEVATION DIFFERENCE = 89.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.331
SUBAREA RUNOFF(CFS) = 23.53
TOTAL AREA(ACRES) = 15.70 TOTAL RUNOFF(CFS) = 23.53

FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 383.00 DOWNSTREAM ELEVATION = 377.00
STREET LENGTH(FEET) = 250.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 13.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 32.54
STREET FLOWING FULL
STREET FLOWDEPTH(FEET) = .45
HALFSTREET FLOODWIDTH(FEET) = 13.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.03
PRODUCT OF DEPTH&VELOCITY = 2.74
STREETFLOW TRAVELTIME(MIN) = .69 TC(MIN) = 16.91

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.242
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 10.12 SUBAREA RUNOFF(CFS) = 18.05
SUMMED AREA(ACRES) = 25.82 TOTAL RUNOFF(CFS) = 41.58
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .49 HALFSTREET FLOODWIDTH(FEET) = 13.00
FLOW VELOCITY(FEET/SEC.) = 6.49 DEPTH*VELOCITY = 3.20

FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 24.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 8.7
UPSTREAM NODE ELEVATION = 377.00
DOWNSTREAM NODE ELEVATION = 370.00
FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 41.58
TRAVEL TIME(MIN.) = 1.63 TC(MIN.) = 18.54

FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.055
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 9.73 SUBAREA RUNOFF(CFS) = 16.35
TOTAL AREA(ACRES) = 35.55 TOTAL RUNOFF(CFS) = 57.93
TC(MIN) = 18.54

FLOW PROCESS FROM NODE 18.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
=====
DEPTH OF FLOW IN 42.0 INCH PIPE IS 31.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 7.5
UPSTREAM NODE ELEVATION = 370.00
DOWNSTREAM NODE ELEVATION = 365.00
FLOWLENGTH(FEET) = 1120.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 57.93
TRAVEL TIME(MIN.) = 2.49 TC(MIN.) = 21.02

FLOW PROCESS FROM NODE 20.00 TO NODE 20.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
 ======
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MINUTES) = 21.02
 RAINFALL INTENSITY (INCH./HOUR) = 2.82
 TOTAL STREAM AREA (ACRES) = 35.55
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 57.93

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	119.53	18.82	3.026
2	57.93	21.02	2.817

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

173.47 169.22
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 RUNOFF(CFS) = 173.47 TIME(MINUTES) = 18.819
 TOTAL AREA(ACRES) = 103.36

 FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 ======
 DEPTH OF FLOW IN 51.0 INCH PIPE IS 40.4 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 14.4
 UPSTREAM NODE ELEVATION = 365.00
 DOWNSTREAM NODE ELEVATION = 360.00
 FLOWLENGTH(FEET) = 400.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 173.47
 TRAVEL TIME(MIN.) = .46 TC(MIN.) = 19.28

 FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 ======
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.979
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 6.79 SUBAREA RUNOFF(CFS) = 11.12
 TOTAL AREA(ACRES) = 110.15 TOTAL RUNOFF(CFS) = 184.59
 TC(MIN) = 19.28

 FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 19.28
RAINFALL INTENSITY (INCH./HOUR) = 2.98
TOTAL STREAM AREA (ACRES) = 110.15
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 184.59

FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 12.32(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 860.00
UPSTREAM ELEVATION = 649.00
DOWNSTREAM ELEVATION = 410.00
ELEVATION DIFFERENCE = 239.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.976
SUBAREA RUNOFF(CFS) = 18.27
TOTAL AREA(ACRES) = 10.21 TOTAL RUNOFF(CFS) = 18.27

FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000
DEPTH OF FLOW IN 24.0 INCH PIPE IS 11.1 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 12.8
UPSTREAM NODE ELEVATION = 410.00
DOWNSTREAM NODE ELEVATION = 360.00
FLOWLENGTH(FEET) = 1330.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 18.27
TRAVEL TIME(MIN.) = 1.73 TC(MIN.) = 14.05

FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.653
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 16.75 SUBAREA RUNOFF(CFS) = 33.65
TOTAL AREA(ACRES) = 26.96 TOTAL RUNOFF(CFS) = 51.92

TC(MIN) = 14.05

FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

===== CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 14.05

RAINFALL INTENSITY (INCH./HOUR) = 3.65

TOTAL STREAM AREA (ACRES) = 26.96

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 51.92

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
---------------	--------------	-------------	-----------------------

1	184.59	19.28	2.979
2	51.92	14.05	3.653

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

226.93 202.44

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 226.93 TIME(MINUTES) = 19.282

TOTAL AREA(ACRES) = 137.11

FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

===== DEPTH OF FLOW IN 72.0 INCH PIPE IS 56.1 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 9.6

UPSTREAM NODE ELEVATION = 360.00

DOWNSHIFT NODE ELEVATION = 357.00

FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 226.93

TRAVEL TIME(MIN.) = 1.47 TC(MIN.) = 20.76

FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.840

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 32.49 SUBAREA RUNOFF(CFS) = 50.75

TOTAL AREA(ACRES) = 169.60 TOTAL RUNOFF(CFS) = 277.68
TC(MIN) = 20.76

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985-1981 HYDROLOGY MANUAL

(C) Copyright 1982,1986 Advanced Engineering Software [AES]

Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS*****

* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN N

SEPTEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

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SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

***** FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

OPERATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<

SOIL CLASSIFICATION IS "D"

SOIL CLASSIFICATION IS "D"
BUREAU DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.74(MINUTES)
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 580.00
 UPSTREAM ELEVATION = 623.00
 DOWNSTREAM ELEVATION = 575.00
 ELEVATION DIFFERENCE = 48.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.892
 SUBAREA RUNOFF(CFS) = 4.17
 TOTAL AREA(ACRES) = 2.38 TOTAL RUNOFF(CFS) = 4.17

 FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<

UPSTREAM ELEVATION = 575.00 DOWNSTREAM ELEVATION = 425.00
 STREET LENGTH(FEET) = 1200.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 47.42
 STREET FLOWDEPTH(FEET) = .42
 HALFSTREET FLOODWIDTH(FEET) = 14.58
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 10.57
 PRODUCT OF DEPTH&VELOCITY = 4.42
 STREETFLOW TRAVELTIME(MIN) = 1.89 TC(MIN) = 14.63

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.559
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 44.55 SUBAREA RUNOFF(CFS) = 87.22
 SUMMED AREA(ACRES) = 46.93 TOTAL RUNOFF(CFS) = 91.38
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .49 HALFSTREET FLOODWIDTH(FEET) = 15.00
 FLOW VELOCITY(FEET/SEC.) = 13.46 DEPTH*VELOCITY = 6.66

 FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<

UPSTREAM ELEVATION = 425.00 DOWNSTREAM ELEVATION = 395.00
 STREET LENGTH(FEET) = 420.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 92.34
 STREET FLOWING FULL

NOTE: STREETFLOW EXCEEDS TOP OF CURB.
 THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
 THAT NEGLIGIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
 THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.
 STREET FLOWDEPTH(FEET) = .53
 HALFSTREET FLOODWIDTH(FEET) = 15.00
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 11.60
 PRODUCT OF DEPTH&VELOCITY = 6.19

STREETFLOW TRAVELTIME(MIN) = .60 TC(MIN) = 15.23

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.468

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 1.00 SUBAREA RUNOFF(CFS) = 1.91

SUMMED AREA(ACRES) = 47.93 TOTAL RUNOFF(CFS) = 93.29

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .53 HALFSTREET FLOODWIDTH(FEET) = 15.00

FLOW VELOCITY(FEET/SEC.) = 11.72 DEPTH*VELOCITY = 6.26

FLOW PROCESS FROM NODE 6.00 TO NODE 10.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.3 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 18.4

UPSTREAM NODE ELEVATION = 395.00

DOWNSHIFT NODE ELEVATION = 365.00

FLOWLENGTH(FEET) = 820.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 93.29

TRAVEL TIME(MIN.) = .74 TC(MIN.) = 15.97

FLOW PROCESS FROM NODE 6.00 TO NODE 10.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.363

SOIL CLASSIFICATION IS "D"

MOBILE HOME DEVELOPMENT RUNOFF COEFFICIENT = .6500

SUBAREA AREA(ACRES) = 45.00 SUBAREA RUNOFF(CFS) = 98.37

TOTAL AREA(ACRES) = 92.93 TOTAL RUNOFF(CFS) = 191.66

TC(MIN) = 15.97

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

(C) Copyright 1982,1986 Advanced Engineering Software [AES]

Especially prepared for:

BSI CONSULTANTS

*****DESCRIPTION OF RESULTS

* CITY OF SANTEE
* 100-YEAR RUNOFF
* BASIN O

NOVEMBER 1989 *

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]
SERIAL No. I0723I
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE 1.00 TO NODE 5.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.24(MINUTES)
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
 UPSTREAM ELEVATION = 1044.00
 DOWNSTREAM ELEVATION = 630.00
 ELEVATION DIFFERENCE = 414.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.993
 SUBAREA RUNOFF(CFS) = 17.70
 TOTAL AREA(ACRES) = 9.85 TOTAL RUNOFF(CFS) = 17.70

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

 >>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<
 ======
 UPSTREAM NODE ELEVATION = 630.00
 DOWNSTREAM NODE ELEVATION = 460.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1450.00
 CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 17.70
 FLOW VELOCITY(FEET/SEC) = 8.92 FLOW DEPTH(FEET) = 1.00
 TRAVEL TIME(MIN.) = 2.71 TC(MIN.) = 14.95

 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 ======
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.510
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SUBAREA AREA(ACRES) = 44.33 SUBAREA RUNOFF(CFS) = 70.02
 TOTAL AREA(ACRES) = 54.18 TOTAL RUNOFF(CFS) = 87.72
 TC(MIN) = 14.95

 FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 6

 >>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
 ======
 UPSTREAM ELEVATION = 460.00 DOWNSTREAM ELEVATION = 405.00
 STREET LENGTH(FEET) = 1100.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFWAYS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 100.70
 STREET FLOWING FULL
 NOTE: STREETFLOW EXCEEDS TOP OF CURB.
 THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
 THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
 THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.
 STREET FLOWDEPTH(FEET) = .59

HALFSTREET FLOODWIDTH(FEET) = 15.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 10.36
PRODUCT OF DEPTH&VELOCITY = 6.14
STREETFLOW TRAVELTIME(MIN) = 1.77 TC(MIN) = 16.72

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.266
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 14.40 SUBAREA RUNOFF(CFS) = 25.87
SUMMED AREA(ACRES) = 68.58 TOTAL RUNOFF(CFS) = 113.59
END OF SUBAREA STREETFLOW HYDRAULICS:
DEPTH(FEET) = .61 HALFSTREET FLOODWIDTH(FEET) = 15.00
FLOW VELOCITY(FEET/SEC.) = 11.02 DEPTH*VELOCITY = 6.75

FLOW PROCESS FROM NODE 11.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 20.0
UPSTREAM NODE ELEVATION = 405.00
DOWNSTREAM NODE ELEVATION = 372.00
FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 113.59
TRAVEL TIME(MIN.) = .71 TC(MIN.) = 17.43

FLOW PROCESS FROM NODE 11.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.179
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 13.50 SUBAREA RUNOFF(CFS) = 23.61
TOTAL AREA(ACRES) = 82.08 TOTAL RUNOFF(CFS) = 137.19
TC(MIN) = 17.43

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 48.0 INCH PIPE IS 33.8 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 14.5
UPSTREAM NODE ELEVATION = 372.00
DOWNSTREAM NODE ELEVATION = 367.00
FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 137.19
TRAVEL TIME(MIN.) = .40 TC(MIN.) = 17.83

FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.133
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 16.95 SUBAREA RUNOFF(CFS) = 29.21
TOTAL AREA(ACRES) = 99.03 TOTAL RUNOFF(CFS) = 166.40
TC(MIN) = 17.83

FLOW PROCESS FROM NODE 20.00 TO NODE 20.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 17.83
RAINFALL INTENSITY (INCH./HOUR) = 3.13
TOTAL STREAM AREA (ACRES) = 99.03
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 166.40

FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 11.71(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00
UPSTREAM ELEVATION = 1134.00
DOWNSTREAM ELEVATION = 850.00
ELEVATION DIFFERENCE = 284.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.108
SUBAREA RUNOFF(CFS) = 19.02
TOTAL AREA(ACRES) = 10.29 TOTAL RUNOFF(CFS) = 19.02

FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION = 850.00

BASIN_O

DOWNTSTREAM NODE ELEVATION = 500.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 2200.00
 CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 19.02
 FLOW VELOCITY(FEET/SEC) = 9.59 FLOW DEPTH(FEET) = 1.00
 TRAVEL TIME(MIN.) = 3.83 TC(MIN.) = 15.54

 FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
 ======
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.423
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 SUBAREA AREA(ACRES) = 64.63 SUBAREA RUNOFF(CFS) = 99.56
 TOTAL AREA(ACRES) = 74.92 TOTAL RUNOFF(CFS) = 118.58
 TC(MIN) = 15.54

 FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 6

 >>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
 ======
 UPSTREAM ELEVATION = 500.00 DOWNTSTREAM ELEVATION = 465.00
 STREET LENGTH(FEET) = 650.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 141.07
 STREET FLOWING FULL
 NOTE: STREETFLOW EXCEEDS TOP OF CURB.
 THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
 THAT NEGLECTABLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
 THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.
 STREET FLOWDEPTH(FEET) = .65
 HALFSTREET FLOODWIDTH(FEET) = 15.00
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 12.29
 PRODUCT OF DEPTH&VELOCITY = 8.00
 STREETFLOW TRAVELTIME(MIN) = .88 TC(MIN) = 16.42

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.304
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 24.72 SUBAREA RUNOFF(CFS) = 44.92
 SUMMED AREA(ACRES) = 99.64 TOTAL RUNOFF(CFS) = 163.50
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .67 HALFSTREET FLOODWIDTH(FEET) = 15.00
 FLOW VELOCITY(FEET/SEC.) = 13.56 DEPTH*VELOCITY = 9.09

 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

 DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.9 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 24.8
 UPSTREAM NODE ELEVATION = 500.00
 DOWNSTREAM NODE ELEVATION = 465.00
 FLOWLENGTH(FEET) = 650.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 163.50
 TRAVEL TIME(MIN.) = .44 TC(MIN.) = 16.86

 FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 8

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

 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.248
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 35.84 SUBAREA RUNOFF(CFS) = 64.03
 TOTAL AREA(ACRES) = 135.48 TOTAL RUNOFF(CFS) = 227.53
 TC(MIN) = 16.86

 FLOW PROCESS FROM NODE 20.00 TO NODE 20.00 IS CODE = 1

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

 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MINUTES) = 16.86
 RAINFALL INTENSITY (INCH./HOUR) = 3.25
 TOTAL STREAM AREA (ACRES) = 135.48
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 227.53

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
------------------	-----------------	----------------	--------------------------

1	166.40	17.83	3.133
2	227.53	16.86	3.248

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

385.87 388.04
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 RUNOFF(CFS) = 388.04 TIME(MINUTES) = 16.858
 TOTAL AREA(ACRES) = 234.51

FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 96.0 INCH PIPE IS 72.9 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 9.5

UPSTREAM NODE ELEVATION = 367.00

DOWNTSTREAM NODE ELEVATION = 365.00

FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 388.04

TRAVEL TIME(MIN.) = 1.49 TC(MIN.) = 18.35

FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 18.35

RAINFALL INTENSITY (INCH./HOUR) = 3.08

TOTAL STREAM AREA (ACRES) = 234.51

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 388.04

FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.24(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 850.00

UPSTREAM ELEVATION = 690.00

DOWNTSTREAM ELEVATION = 435.00

ELEVATION DIFFERENCE = 255.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.994

SUBAREA RUNOFF(CFS) = 10.42

TOTAL AREA(ACRES) = 5.80 TOTAL RUNOFF(CFS) = 10.42

FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000

DEPTH OF FLOW IN 24.0 INCH PIPE IS 6.7 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 14.6

UPSTREAM NODE ELEVATION = 435.00

DOWNSTREAM NODE ELEVATION = 365.00
 FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 10.42
 TRAVEL TIME(MIN.) = .97 TC(MIN.) = 13.21

 FLOW PROCESS FROM NODE 22.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.802
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 14.00 SUBAREA RUNOFF(CFS) = 29.28
 TOTAL AREA(ACRES) = 19.80 TOTAL RUNOFF(CFS) = 39.70
 TC(MIN) = 13.21

 FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MINUTES) = 13.21
 RAINFALL INTENSITY (INCH./HOUR) = 3.80
 TOTAL STREAM AREA (ACRES) = 19.80
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 39.70

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
---------------	--------------	-------------	-----------------------

1	388.04	18.35	3.075
2	39.70	13.21	3.802

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

420.14 353.54
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 RUNOFF(CFS) = 420.14 TIME(MINUTES) = 18.353
 TOTAL AREA(ACRES) = 254.31

 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 84.0 INCH PIPE IS 67.4 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 12.7

UPSTREAM NODE ELEVATION = 365.00
DOWNSTREAM NODE ELEVATION = 364.00
FLOWLENGTH(FEET) = 200.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 420.14
TRAVEL TIME(MIN.) = .26 TC(MIN.) = 18.62

FLOW PROCESS FROM NODE 30.00 TO NODE 30.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 18.62
RAINFALL INTENSITY (INCH./HOUR) = 3.05
TOTAL STREAM AREA (ACRES) = 254.31
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 420.14

FLOW PROCESS FROM NODE 26.00 TO NODE 27.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
WITH 10-MINUTES ADDED = 11.98(MINUTES)
INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00
UPSTREAM ELEVATION = 690.00
DOWNSTREAM ELEVATION = 400.00
ELEVATION DIFFERENCE = 290.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.048
SUBAREA RUNOFF(CFS) = 11.97
TOTAL AREA(ACRES) = 6.57 TOTAL RUNOFF(CFS) = 11.97

FLOW PROCESS FROM NODE 27.00 TO NODE 30.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM ELEVATION = 400.00 DOWNSTREAM ELEVATION = 364.00
STREET LENGTH(FEET) = 1100.00 CURB HEIGHT(INCHES) = 6.
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
SPECIFIED NUMBER OF HALFWIDTHS CARRYING RUNOFF = 2
**TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 37.57
STREET FLOWING FULL
STREET FLOWDEPTH(FEET) = .48
HALFWIDTH FLOODWIDTH(FEET) = 15.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.06
PRODUCT OF DEPTH&VELOCITY = 2.88
STREETFLOW TRAVELTIME(MIN) = 3.03 TC(MIN) = 15.01

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.501
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 26.40 SUBAREA RUNOFF(CFS) = 50.83
 SUMMED AREA(ACRES) = 32.97 TOTAL RUNOFF(CFS) = 62.80
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .53 HALFSTREET FLOODWIDTH(FEET) = 15.00
 FLOW VELOCITY(FEET/SEC.) = 7.89 DEPTH*VELOCITY = 4.21

 FLOW PROCESS FROM NODE 30.00 TO NODE 30.00 IS CODE = 1

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

=====
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MINUTES) = 15.01
 RAINFALL INTENSITY (INCH./HOUR) = 3.50
 TOTAL STREAM AREA (ACRES) = 32.97
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 62.80

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	420.14	18.62	3.047
2	62.80	15.01	3.501

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

474.80 428.49
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 RUNOFF(CFS) = 474.80 TIME(MINUTES) = 18.615
 TOTAL AREA(ACRES) = 287.28

 FLOW PROCESS FROM NODE 31.00 TO NODE 32.00 IS CODE = 2

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

=====
 SOIL CLASSIFICATION IS "D"
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
 NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION
 WITH 10-MINUTES ADDED = 12.58(MINUTES)
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 980.00
 UPSTREAM ELEVATION = 845.00
 DOWNSTREAM ELEVATION = 575.00
 ELEVATION DIFFERENCE = 270.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.923
 SUBAREA RUNOFF(CFS) = 13.59
 TOTAL AREA(ACRES) = 7.70 TOTAL RUNOFF(CFS) = 13.59

```
*****
FLOW PROCESS FROM NODE    32.00 TO NODE    35.00 IS CODE =  5
-----
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<
=====
UPSTREAM NODE ELEVATION =    575.00
DOWNSTREAM NODE ELEVATION =   435.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  910.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 13.59
FLOW VELOCITY(FEET/SEC) = 8.80 FLOW DEPTH(FEET) = .88
TRAVEL TIME(MIN.) = 1.72 TC(MIN.) = 14.30

*****
FLOW PROCESS FROM NODE    32.00 TO NODE    35.00 IS CODE =  8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.612
SOIL CLASSIFICATION IS "D"
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500
SUBAREA AREA(ACRES) = 12.40 SUBAREA RUNOFF(CFS) = 20.15
TOTAL AREA(ACRES) = 20.10 TOTAL RUNOFF(CFS) = 33.75
TC(MIN) = 14.30

*****
FLOW PROCESS FROM NODE    35.00 TO NODE    40.00 IS CODE =  3
-----
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 16.3
UPSTREAM NODE ELEVATION = 435.00
DOWNSTREAM NODE ELEVATION = 382.00
FLOWLENGTH(FEET) = 1100.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 33.75
TRAVEL TIME(MIN.) = 1.12 TC(MIN.) = 15.43

*****
FLOW PROCESS FROM NODE    35.00 TO NODE    40.00 IS CODE =  8
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.440
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 16.13 SUBAREA RUNOFF(CFS) = 30.51
TOTAL AREA(ACRES) = 36.23 TOTAL RUNOFF(CFS) = 64.26
```

TC(MIN) = 15.43

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.0 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.3
UPSTREAM NODE ELEVATION = 382.00
DOWNSTREAM NODE ELEVATION = 370.00
FLOWLENGTH(FEET) = 450.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 64.26
TRAVEL TIME(MIN.) = .49 TC(MIN.) = 15.92

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.371
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 9.24 SUBAREA RUNOFF(CFS) = 17.13
TOTAL AREA(ACRES) = 45.47 TOTAL RUNOFF(CFS) = 81.39
TC(MIN) = 15.92

FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
DEPTH OF FLOW IN 36.0 INCH PIPE IS 25.4 INCHES
PIPEFLOW VELOCITY(FEET/SEC.) = 15.3
UPSTREAM NODE ELEVATION = 370.00
DOWNSTREAM NODE ELEVATION = 355.00
FLOWLENGTH(FEET) = 650.00 MANNINGS N = .013
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPEFLOW THRU SUBAREA(CFS) = 81.39
TRAVEL TIME(MIN.) = .71 TC(MIN.) = 16.63

FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MINUTES) = 16.63

RAINFALL INTENSITY (INCH./HOUR) = 3.28
TOTAL STREAM AREA (ACRES) = 45.47
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 81.39

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 9.61 RAIN INTENSITY(INCH/HOUR) = 4.67
TOTAL AREA(ACRES) = 6.50 TOTAL RUNOFF(CFS) = 16.68

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 725.00
DOWNSTREAM NODE ELEVATION = 450.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1400.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 16.68
FLOW VELOCITY(FEET/SEC) = 9.90 FLOW DEPTH(FEET) = .92
TRAVEL TIME(MIN.) = 2.36 TC(MIN.) = 11.97

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.052
SOIL CLASSIFICATION IS "D"
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
SUBAREA AREA(ACRES) = 29.40 SUBAREA RUNOFF(CFS) = 65.51
TOTAL AREA(ACRES) = 35.90 TOTAL RUNOFF(CFS) = 82.19
TC(MIN) = 11.97

FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 450.00
DOWNSTREAM NODE ELEVATION = 404.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 82.19
 FLOW VELOCITY(FEET/SEC) = 8.74 FLOW DEPTH(FEET) = 2.17
 TRAVEL TIME(MIN.) = 1.91 TC(MIN.) = 13.87

 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 8

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<
 ======
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.683
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 54.70 SUBAREA RUNOFF(CFS) = 110.81
 TOTAL AREA(ACRES) = 90.60 TOTAL RUNOFF(CFS) = 193.00
 TC(MIN) = 13.87

 FLOW PROCESS FROM NODE 14.00 TO NODE 48.00 IS CODE = 6

 >>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<
 ======
 UPSTREAM ELEVATION = 404.00 DOWNSTREAM ELEVATION = 364.00
 STREET LENGTH(FEET) = 1350.00 CURB HEIGHT(INCHES) = 6.
 STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
 **TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 222.71
 STREET FLOWING FULL
 NOTE: STREETFLOW EXCEEDS TOP OF CURB.
 THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION
 THAT NEGLECTABLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.
 THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.
 STREET FLOWDEPTH(FEET) = .87
 HALFSTREET FLOODWIDTH(FEET) = 15.00
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 12.43
 PRODUCT OF DEPTH&VELOCITY = 10.76
 STREETFLOW TRAVELTIME(MIN) = 1.81 TC(MIN) = 15.68

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.403
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 31.70 SUBAREA RUNOFF(CFS) = 59.33
 SUMMED AREA(ACRES) = 122.30 TOTAL RUNOFF(CFS) = 252.33
 END OF SUBAREA STREETFLOW HYDRAULICS:
 DEPTH(FEET) = .90 HALFSTREET FLOODWIDTH(FEET) = 15.00
 FLOW VELOCITY(FEET/SEC.) = 13.22 DEPTH*VELOCITY = 11.96

 FLOW PROCESS FROM NODE 48.00 TO NODE 50.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<
 ======

DEPTH OF FLOW IN 51.0 INCH PIPE IS 36.5 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 23.2
 UPSTREAM NODE ELEVATION = 364.00
 DOWNSTREAM NODE ELEVATION = 355.00
 FLOWLENGTH(FEET) = 270.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 252.33
 TRAVEL TIME(MIN.) = .19 TC(MIN.) = 15.88

 FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 1

 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
 ======
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MINUTES) = 15.88
 RAINFALL INTENSITY (INCH./HOUR) = 3.38
 TOTAL STREAM AREA (ACRES) = 122.30
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 252.33

CONFLUENCE INFORMATION:

STREAM NUMBER	RUNOFF (CFS)	TIME (MIN.)	INTENSITY (INCH/HOUR)
1	81.39	16.63	3.277
2	252.33	15.88	3.376

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:
 326.32 331.34
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 RUNOFF(CFS) = 331.34 TIME(MINUTES) = 15.878
 TOTAL AREA(ACRES) = 167.77

 FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 3

 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 ======
 DEPTH OF FLOW IN 96.0 INCH PIPE IS 73.8 INCHES
 PIPEFLOW VELOCITY(FEET/SEC.) = 8.0
 UPSTREAM NODE ELEVATION = 355.00
 DOWNSTREAM NODE ELEVATION = 353.00
 FLOWLENGTH(FEET) = 1200.00 MANNINGS N = .013
 ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1
 PIPEFLOW THRU SUBAREA(CFS) = 331.34
 TRAVEL TIME(MIN.) = 2.50 TC(MIN.) = 18.38

 FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.072

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 22.30 SUBAREA RUNOFF(CFS) = 37.68

TOTAL AREA(ACRES) = 190.07 TOTAL RUNOFF(CFS) = 369.01

TC(MIN) = 18.38

***** FLOW PROCESS FROM NODE 55.00 TO NODE 60.00 IS CODE = 3 *****

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 96.0 INCH PIPE IS 76.2 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 8.6

UPSTREAM NODE ELEVATION = 353.00

DOWNTSTREAM NODE ELEVATION = 350.00

FLOWLENGTH(FEET) = 1550.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 96.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 369.01

TRAVEL TIME(MIN.) = 2.99 TC(MIN.) = 21.38

***** FLOW PROCESS FROM NODE 55.00 TO NODE 60.00 IS CODE = 8 *****

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.787

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 40.04 SUBAREA RUNOFF(CFS) = 61.38

TOTAL AREA(ACRES) = 230.11 TOTAL RUNOFF(CFS) = 430.39

TC(MIN) = 21.38

===== END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
1985, 1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

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\*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*  
\* CITY OF SANTEE \*  
\* 100-YEAR RUNOFF \*  
\* BASIN P \* SEPTEMBER 1989 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.700

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.81(MINUTES)  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 500.00  
UPSTREAM ELEVATION = 905.00  
DOWNSTREAM ELEVATION = 815.00  
ELEVATION DIFFERENCE = 90.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.086  
SUBAREA RUNOFF(CFS) = 4.74  
TOTAL AREA(ACRES) = 2.58 TOTAL RUNOFF(CFS) = 4.74

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 815.00  
DOWNSTREAM NODE ELEVATION = 435.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2900.00  
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 4.74  
FLOW VELOCITY(FEET/SEC) = 4.07 FLOW DEPTH(FEET) = .21  
TRAVEL TIME(MIN.) = 11.88 TC(MIN.) = 23.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
\*\*\*\*\*  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.608  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 96.14 SUBAREA RUNOFF(CFS) = 112.83  
TOTAL AREA(ACRES) = 98.72 TOTAL RUNOFF(CFS) = 117.57  
TC(MIN) = 23.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
\*\*\*\*\*  
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.1  
UPSTREAM NODE ELEVATION = 435.00  
DOWNSTREAM NODE ELEVATION = 398.00  
FLOWLENGTH(FEET) = 950.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 117.57  
TRAVEL TIME(MIN.) = .79 TC(MIN.) = 24.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.553  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = 8.20 SUBAREA RUNOFF(CFS) = 19.89  
TOTAL AREA(ACRES) = 106.92 TOTAL RUNOFF(CFS) = 137.46  
TC(MIN) = 24.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====  
DEPTH OF FLOW IN 45.0 INCH PIPE IS 32.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.4  
UPSTREAM NODE ELEVATION = 398.00  
DOWNSTREAM NODE ELEVATION = 372.00  
FLOWLENGTH(FEET) = 1320.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 137.46  
TRAVEL TIME(MIN.) = 1.34 TC(MIN.) = 25.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.467  
SOIL CLASSIFICATION IS "D"  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 69.04 SUBAREA RUNOFF(CFS) = 144.77  
TOTAL AREA(ACRES) = 175.96 TOTAL RUNOFF(CFS) = 282.24  
TC(MIN) = 25.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====  
DEPTH OF FLOW IN 66.0 INCH PIPE IS 49.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.6  
UPSTREAM NODE ELEVATION = 372.00  
DOWNSTREAM NODE ELEVATION = 367.00  
FLOWLENGTH(FEET) = 540.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 66.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 282.24

TRAVEL TIME(MIN.) = .61 TC(MIN.) = 26.44

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.430

SOIL CLASSIFICATION IS "D"

COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500

SUBAREA AREA(ACRES) = 18.00 SUBAREA RUNOFF(CFS) = 37.18

TOTAL AREA(ACRES) = 193.96 TOTAL RUNOFF(CFS) = 319.41

TC(MIN) = 26.44

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 26.44

RAINFALL INTENSITY (INCH./HOUR) = 2.43

TOTAL STREAM AREA (ACRES) = 193.96

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 319.41

\*\*\*\*\*  
FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.30(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 930.00

UPSTREAM ELEVATION = 735.00

DOWNSTREAM ELEVATION = 425.00

ELEVATION DIFFERENCE = 310.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.980

SUBAREA RUNOFF(CFS) = 10.23

TOTAL AREA(ACRES) = 5.71 TOTAL RUNOFF(CFS) = 10.23

\*\*\*\*\*  
FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 425.00

DOWNSTREAM NODE ELEVATION = 389.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 460.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 10.23  
FLOW VELOCITY(FEET/SEC) = 6.62 FLOW DEPTH(FEET) = .88  
TRAVEL TIME(MIN.) = 1.16 TC(MIN.) = 13.46

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.756  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 17.90 SUBAREA RUNOFF(CFS) = 30.25  
TOTAL AREA(ACRES) = 23.61 TOTAL RUNOFF(CFS) = 40.48  
TC(MIN) = 13.46

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 17.7  
UPSTREAM NODE ELEVATION = 389.00  
DOWNSTREAM NODE ELEVATION = 375.00  
FLOWLENGTH(FEET) = 260.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 40.48  
TRAVEL TIME(MIN.) = .25 TC(MIN.) = 13.71

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 19.00 TO NODE 20.00 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<  
=====  
UPSTREAM ELEVATION = 375.00 DOWNSTREAM ELEVATION = 372.00  
STREET LENGTH(FEET) = 830.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 30.00 STREET CROSSFALL(DECIMAL) = .0200  
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2  
\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 54.98  
\*\*\*STREET FLOWING FULL\*\*\*  
NOTE: STREETFLOW EXCEEDS TOP OF CURB.  
THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION  
THAT NEGLECTABLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.  
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.  
STREET FLOWDEPTH(FEET) = .74  
HALFSTREET FLOODWIDTH(FEET) = 30.00  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.92  
PRODUCT OF DEPTH&VELOCITY = 2.15

STREETFLOW TRAVELTIME(MIN) = 4.74 TC(MIN) = 18.44

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.066

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 17.36 SUBAREA RUNOFF(CFS) = 29.27

SUMMED AREA(ACRES) = 40.97 TOTAL RUNOFF(CFS) = 69.75

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .79 HALFSTREET FLOODWIDTH(FEET) = 30.00

FLOW VELOCITY(FEET/SEC.) = 3.12 DEPTH\*VELOCITY = 2.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<

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

DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.2 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 8.0

UPSTREAM NODE ELEVATION = 372.00

DOWNSTREAM NODE ELEVATION = 367.00

FLOWLENGTH(FEET) = 1080.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 69.75

TRAVEL TIME(MIN.) = 2.25 TC(MIN.) = 20.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.846

SOIL CLASSIFICATION IS "D"

COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500

SUBAREA AREA(ACRES) = 20.00 SUBAREA RUNOFF(CFS) = 48.38

TOTAL AREA(ACRES) = 60.97 TOTAL RUNOFF(CFS) = 118.13

TC(MIN) = 20.69

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.69

RAINFALL INTENSITY (INCH./HOUR) = 2.85

TOTAL STREAM AREA (ACRES) = 60.97

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 118.13

CONFLUENCE INFORMATION:

STREAM RUNOFF TIME INTENSITY

BASIN\_P

| NUMBER | (CFS)  | (MIN.) | (INCH/HOUR) |
|--------|--------|--------|-------------|
| 1      | 319.41 | 26.44  | 2.430       |
| 2      | 118.13 | 20.69  | 2.846       |

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS  
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

420.27 390.84

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 420.27 TIME(MINUTES) = 26.440  
 TOTAL AREA(ACRES) = 254.93

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 69.0 INCH PIPE IS 54.7 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 19.1  
 UPSTREAM NODE ELEVATION = 367.00  
 DOWNSTREAM NODE ELEVATION = 350.00  
 FLOWLENGTH(FEET) = 1160.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 69.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 420.27  
 TRAVEL TIME(MIN.) = 1.01 TC(MIN.) = 27.45

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.372

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
 SUBAREA AREA(ACRES) = 43.16 SUBAREA RUNOFF(CFS) = 56.30  
 TOTAL AREA(ACRES) = 298.09 TOTAL RUNOFF(CFS) = 476.57  
 TC(MIN) = 27.45

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 114.0 INCH PIPE IS 91.9 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 7.8  
 UPSTREAM NODE ELEVATION = 350.00  
 DOWNSTREAM NODE ELEVATION = 349.00  
 FLOWLENGTH(FEET) = 800.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 114.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 476.57

TRAVEL TIME(MIN.) = 1.71 TC(MIN.) = 29.17

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.281

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 24.70 SUBAREA RUNOFF(CFS) = 30.98

TOTAL AREA(ACRES) = 322.79 TOTAL RUNOFF(CFS) = 507.55

TC(MIN) = 29.17

\*\*\*\*\*  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<

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

DEPTH OF FLOW IN 93.0 INCH PIPE IS 74.3 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 12.6

UPSTREAM NODE ELEVATION = 349.00

DOWNSTREAM NODE ELEVATION = 344.00

FLOWLENGTH(FEET) = 1170.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 93.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 507.55

TRAVEL TIME(MIN.) = 1.55 TC(MIN.) = 30.72

\*\*\*\*\*  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.206

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 13.68 SUBAREA RUNOFF(CFS) = 16.60

TOTAL AREA(ACRES) = 336.47 TOTAL RUNOFF(CFS) = 524.15

TC(MIN) = 30.72

=====

END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985-1981 HYDROLOGY MANUAL

(C) Copyright 1982,1986 Advanced Engineering Software [AES]

Especially prepared for:

BSI CONSULTANTS

## \*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*

- \* CITY OF SANTEE
- \* 100-YEAR RUNOFF
- \* BASIN Q

JANUARY 1990 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

-----

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 5.55 RAIN INTENSITY(INCH/HOUR) = 6.40  
TOTAL AREA(ACRES) = 9.50 TOTAL RUNOFF(CFS) = 57.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 33.0 INCH PIPE IS 25.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 11.6  
UPSTREAM NODE ELEVATION = 390.00  
DOWNSTREAM NODE ELEVATION = 379.00  
FLOWLENGTH(FEET) = 750.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 57.80  
TRAVEL TIME(MIN.) = 1.07 TC(MIN.) = 6.62

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.714  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = 22.00 SUBAREA RUNOFF(CFS) = 119.42  
TOTAL AREA(ACRES) = 31.50 TOTAL RUNOFF(CFS) = 177.22  
TC(MIN.) = 6.62

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.6 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 13.8  
UPSTREAM NODE ELEVATION = 379.00  
DOWNSTREAM NODE ELEVATION = 367.00  
FLOWLENGTH(FEET) = 1110.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 177.22  
TRAVEL TIME(MIN.) = 1.34 TC(MIN.) = 7.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.075  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500

SUBAREA AREA(ACRES) = 27.40 SUBAREA RUNOFF(CFS) = 132.09  
TOTAL AREA(ACRES) = 58.90 TOTAL RUNOFF(CFS) = 309.31  
TC(MIN) = 7.96

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 81.0 INCH PIPE IS 61.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.6  
UPSTREAM NODE ELEVATION = 367.00  
DOWNSTREAM NODE ELEVATION = 362.00  
FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 81.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 309.31  
TRAVEL TIME(MIN.) = 2.12 TC(MIN.) = 10.08

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.358  
SOIL CLASSIFICATION IS "D"  
MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000  
SUBAREA AREA(ACRES) = 26.92 SUBAREA RUNOFF(CFS) = 82.12  
TOTAL AREA(ACRES) = 85.82 TOTAL RUNOFF(CFS) = 391.44  
TC(MIN) = 10.08

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 75.0 INCH PIPE IS 55.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.0  
UPSTREAM NODE ELEVATION = 362.00  
DOWNSTREAM NODE ELEVATION = 355.00  
FLOWLENGTH(FEET) = 750.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 75.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 391.44  
TRAVEL TIME(MIN.) = .78 TC(MIN.) = 10.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.153  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = 28.19 SUBAREA RUNOFF(CFS) = 111.22  
TOTAL AREA(ACRES) = 114.01 TOTAL RUNOFF(CFS) = 502.65  
TC(MIN) = 10.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 63.0 INCH PIPE IS 46.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 29.4  
UPSTREAM NODE ELEVATION = 355.00  
DOWNSTREAM NODE ELEVATION = 349.00  
FLOWLENGTH(FEET) = 150.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 63.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 502.65  
TRAVEL TIME(MIN.) = .09 TC(MIN.) = 10.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.132  
SOIL CLASSIFICATION IS "D"  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 11.46 SUBAREA RUNOFF(CFS) = 40.25  
TOTAL AREA(ACRES) = 125.47 TOTAL RUNOFF(CFS) = 542.90  
TC(MIN) = 10.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 10.95  
RAINFALL INTENSITY (INCH./HOUR) = 4.13  
TOTAL STREAM AREA (ACRES) = 125.47  
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 542.90

\*\*\*\*\*  
FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 24.53 RAIN INTENSITY(INCH/HOUR) = 2.46  
TOTAL AREA(ACRES) = 11.42 TOTAL RUNOFF(CFS) = 19.63

\*\*\*\*\*  
FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 30.0 INCH PIPE IS 24.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 4.7  
UPSTREAM NODE ELEVATION = 358.00  
DOWNSTREAM NODE ELEVATION = 356.00  
FLOWLENGTH(FEET) = 750.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 19.63  
TRAVEL TIME(MIN.) = 2.68 TC(MIN.) = 27.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 22.00 TO NODE 23.00 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.297  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = 7.89 SUBAREA RUNOFF(CFS) = 17.22  
TOTAL AREA(ACRES) = 19.31 TOTAL RUNOFF(CFS) = 36.85  
TC(MIN) = 27.21

\*\*\*\*\*  
FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 7.3  
UPSTREAM NODE ELEVATION = 356.00  
DOWNSTREAM NODE ELEVATION = 352.00  
FLOWLENGTH(FEET) = 690.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 36.85  
TRAVEL TIME(MIN.) = 1.57 TC(MIN.) = 28.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 23.00 TO NODE 24.00 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.215

SOIL CLASSIFICATION IS "D"

COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500

SUBAREA AREA(ACRES) = 7.89 SUBAREA RUNOFF(CFS) = 14.86

TOTAL AREA(ACRES) = 27.20 TOTAL RUNOFF(CFS) = 51.70

TC(MIN) = 28.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.0 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 7.3

UPSTREAM NODE ELEVATION = 352.00

DOWNSTRM NODE ELEVATION = 349.00

FLOWLENGTH(FEET) = 650.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 51.70

TRAVEL TIME(MIN.) = 1.48 TC(MIN.) = 30.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 24.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.145

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 20.26 SUBAREA RUNOFF(CFS) = 23.90

TOTAL AREA(ACRES) = 47.46 TOTAL RUNOFF(CFS) = 75.60

TC(MIN) = 30.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 25.00 IS CODE = 1

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

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 30.26

RAINFALL INTENSITY (INCH./HOUR) = 2.14

TOTAL STREAM AREA (ACRES) = 47.46

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 75.60

#### CONFLUENCE INFORMATION:

| STREAM<br>NUMBER | RUNOFF<br>(CFS) | TIME<br>(MIN.) | INTENSITY<br>(INCH/HOUR) |
|------------------|-----------------|----------------|--------------------------|
|------------------|-----------------|----------------|--------------------------|

|   |        |       |       |
|---|--------|-------|-------|
| 1 | 542.90 | 10.95 | 4.132 |
| 2 | 75.60  | 30.26 | 2.145 |

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS  
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

582.15 357.39

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 582.15 TIME(MINUTES) = 10.948

TOTAL AREA(ACRES) = 172.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 5

>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>TRAVELTIME THRU SUBAREA<<<

UPSTREAM NODE ELEVATION = 349.00

DOWNTSTREAM NODE ELEVATION = 346.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00

CHANNEL BASE(FEET) = 6.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 4.50

CHANNEL FLOW THRU SUBAREA(CFS) = 582.15

=>>ERROR: 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.

FLOW VELOCITY(FEET/SEC) = 21.56 FLOW DEPTH(FEET) = 4.50  
TRAVEL TIME(MIN.) = 1.04 TC(MIN.) = 11.99

=>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.896

SOIL CLASSIFICATION IS "D"

MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000

SUBAREA AREA(ACRES) = 17.29 SUBAREA RUNOFF(CFS) = 47.16

TOTAL AREA(ACRES) = 190.22 TOTAL RUNOFF(CFS) = 629.30

TC(MIN) = 11.99

\*\*\*\*\*  
FLOW PROCESS FROM NODE 26.00 TO NODE 27.00 IS CODE = 7

>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 5.53 RAIN INTENSITY(INCH/HOUR) = 6.42

TOTAL AREA(ACRES) = 5.72 TOTAL RUNOFF(CFS) = 34.88

\*\*\*\*\*  
FLOW PROCESS FROM NODE 27.00 TO NODE 28.00 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<  
=====  
UPSTREAM ELEVATION = 355.00 DOWNSTREAM ELEVATION = 352.00  
STREET LENGTH(FEET) = 400.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200  
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2  
\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 57.65  
\*\*\*STREET FLOWING FULL\*\*\*

NOTE: STREETFLOW EXCEEDS TOP OF CURB.  
THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION  
THAT NEGLECTABLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.  
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.  
STREET FLOWDEPTH(FEET) = .67  
HALFSTREET FLOODWIDTH(FEET) = 15.00  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.78  
PRODUCT OF DEPTH&VELOCITY = 3.20  
STREETFLOW TRAVELTIME(MIN) = 1.39 TC(MIN) = 6.92

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.552  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = 8.62 SUBAREA RUNOFF(CFS) = 45.47  
SUMMED AREA(ACRES) = 14.34 TOTAL RUNOFF(CFS) = 80.35  
END OF SUBAREA STREETFLOW HYDRAULICS:  
DEPTH(FEET) = .75 HALFSTREET FLOODWIDTH(FEET) = 15.00  
FLOW VELOCITY(FEET/SEC.) = 5.58 DEPTH\*VELOCITY = 4.18

\*\*\*\*\*  
FLOW PROCESS FROM NODE 28.00 TO NODE 29.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 6.1  
UPSTREAM NODE ELEVATION = 352.00  
DOWNSTREAM NODE ELEVATION = 350.00  
FLOWLENGTH(FEET) = 940.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 80.35  
TRAVEL TIME(MIN.) = 2.55 TC(MIN.) = 9.47

\*\*\*\*\*  
FLOW PROCESS FROM NODE 28.00 TO NODE 29.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.536

SOIL CLASSIFICATION IS "D"

MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000

SUBAREA AREA(ACRES) = 16.04 SUBAREA RUNOFF(CFS) = 50.94

TOTAL AREA(ACRES) = 30.38 TOTAL RUNOFF(CFS) = 131.28

TC(MIN) = 9.47

\*\*\*\*\*  
FLOW PROCESS FROM NODE 31.00 TO NODE 32.00 IS CODE = 7  
-----

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 38.83 RAIN INTENSITY(INCH/HOUR) = 1.83

TOTAL AREA(ACRES) = 9.80 TOTAL RUNOFF(CFS) = 9.84

\*\*\*\*\*  
FLOW PROCESS FROM NODE 32.00 TO NODE 35.00 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 352.00 DOWNSTREAM ELEVATION = 340.00

STREET LENGTH(FEET) = 1300.00 CURB HEIGHT(INCHES) = 6.

STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 23.73

\*\*\*STREET FLOWING FULL\*\*\*

STREET FLOWDEPTH(FEET) = .49

HALFSTREET FLOODWIDTH(FEET) = 15.00

AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.50

PRODUCT OF DEPTH&VELOCITY = 1.73

STREETFLOW TRAVELTIME(MIN) = 6.20 TC(MIN) = 45.03

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.660

SOIL CLASSIFICATION IS "D"

COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500

SUBAREA AREA(ACRES) = 19.86 SUBAREA RUNOFF(CFS) = 28.02

SUMMED AREA(ACRES) = 29.66 TOTAL RUNOFF(CFS) = 37.86

END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .55 HALFSTREET FLOODWIDTH(FEET) = 15.00

FLOW VELOCITY(FEET/SEC.) = 4.43 DEPTH\*VELOCITY = 2.45

\*\*\*\*\*  
FLOW PROCESS FROM NODE 36.00 TO NODE 37.00 IS CODE = 2  
-----

END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985-1981 HYDROLOGY MANUAL

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**Especially prepared for:**

BSI CONSULTANTS

## \*\*\*\*\* DESCRIPTION OF RESULTS \*\*\*\*\*

\* CITY OF SANTEE  
\* 100-YEAR RUNOFF  
\* BASIN R

JANUARY 1990 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

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VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 5.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
=====  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 420.00

UPSTREAM ELEVATION = 358.00  
 DOWNSTREAM ELEVATION = 356.00  
 ELEVATION DIFFERENCE = 2.00  
 URBAN SUBAREA OVERLAND TIME OF FLOW(MINUTES) = 7.304  
 \*CAUTION: SUBAREA SLOPE EXCEEDS COUNTY NOMOGRAPH  
 DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.365  
 SUBAREA RUNOFF(CFS) = 11.16  
 TOTAL AREA(ACRES) = 2.19 TOTAL RUNOFF(CFS) = 11.16

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 5.00 TO NODE 7.00 IS CODE = 6

-----  
 >>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<  
 ======  
 UPSTREAM ELEVATION = 356.00 DOWNSTREAM ELEVATION = 355.00  
 STREET LENGTH(FEET) = 400.00 CURB HEIGHT(INCHES) = 6.  
 STREET HALFWIDTH(FEET) = 41.00 STREET CROSSFALL(DECIMAL) = .0200  
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1  
 \*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 17.80  
 NOTE: STREETFLOW EXCEEDS TOP OF CURB.  
 THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION  
 THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.  
 THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.  
 STREET FLOWDEPTH(FEET) = .71  
 HALFSTREET FLOODWIDTH(FEET) = 28.96  
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.09  
 PRODUCT OF DEPTH&VELOCITY = 1.48  
 STREETFLOW TRAVELTIME(MIN) = 3.19 TC(MIN) = 10.49

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.248  
 SOIL CLASSIFICATION IS "D"  
 INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
 SUBAREA AREA(ACRES) = 3.26 SUBAREA RUNOFF(CFS) = 13.15  
 SUMMED AREA(ACRES) = 5.45 TOTAL RUNOFF(CFS) = 24.32  
 END OF SUBAREA STREETFLOW HYDRAULICS:  
 DEPTH(FEET) = .77 HALFSTREET FLOODWIDTH(FEET) = 32.05  
 FLOW VELOCITY(FEET/SEC.) = 2.34 DEPTH\*VELOCITY = 1.80

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 3

-----  
 >>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
 ======  
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 23.4 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 5.4  
 UPSTREAM NODE ELEVATION = 355.00  
 DOWNSTREAM NODE ELEVATION = 354.00  
 FLOWLENGTH(FEET) = 307.00 MANNINGS N = .013  
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
 PIPEFLOW THRU SUBAREA(CFS) = 24.32  
 TRAVEL TIME(MIN.) = .95 TC(MIN.) = 11.44

\*\*\*\*\*  
FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.018  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = .81 SUBAREA RUNOFF(CFS) = 3.09  
TOTAL AREA(ACRES) = 6.26 TOTAL RUNOFF(CFS) = 27.41  
TC(MIN) = 11.44

\*\*\*\*\*  
FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 33.0 INCH PIPE IS 26.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 5.3  
UPSTREAM NODE ELEVATION = 354.00  
DOWNSTREAM NODE ELEVATION = 353.00  
FLOWLENGTH(FEET) = 333.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 27.41  
TRAVEL TIME(MIN.) = 1.05 TC(MIN.) = 12.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.796  
SOIL CLASSIFICATION IS "D"  
INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500  
SUBAREA AREA(ACRES) = 5.31 SUBAREA RUNOFF(CFS) = 19.15  
TOTAL AREA(ACRES) = 11.57 TOTAL RUNOFF(CFS) = 46.56  
TC(MIN) = 12.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 39.0 INCH PIPE IS 27.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 7.5  
UPSTREAM NODE ELEVATION = 353.00  
DOWNSTREAM NODE ELEVATION = 351.50  
FLOWLENGTH(FEET) = 296.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 46.56  
TRAVEL TIME(MIN.) = .66 TC(MIN.) = 13.14

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.673

SOIL CLASSIFICATION IS "D"

INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500

SUBAREA AREA(ACRES) = 2.23 SUBAREA RUNOFF(CFS) = 7.78

TOTAL AREA(ACRES) = 13.80 TOTAL RUNOFF(CFS) = 54.34

TC(MIN) = 13.14

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.1 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 7.6

UPSTREAM NODE ELEVATION = 351.50

DOWNSRAME NODE ELEVATION = 350.00

FLOWLENGTH(FEET) = 315.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 54.34

TRAVEL TIME(MIN.) = .69 TC(MIN.) = 13.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 8

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

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.554

SOIL CLASSIFICATION IS "D"

INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500

SUBAREA AREA(ACRES) = 1.88 SUBAREA RUNOFF(CFS) = 6.35

TOTAL AREA(ACRES) = 15.68 TOTAL RUNOFF(CFS) = 60.68

TC(MIN) = 13.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 11.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

===== DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.2 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 9.5

UPSTREAM NODE ELEVATION = 350.00  
DOWNSTREAM NODE ELEVATION = 348.00  
FLOWLENGTH(FEET) = 253.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 60.68  
TRAVEL TIME(MIN.) = .45 TC(MIN.) = 14.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 14.28  
RAINFALL INTENSITY (INCH./HOUR) = 3.48  
TOTAL STREAM AREA (ACRES) = 15.68  
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 60.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 24.80 RAIN INTENSITY(INCH/HOUR) = 2.44  
TOTAL AREA(ACRES) = 3.00 TOTAL RUNOFF(CFS) = 4.02

\*\*\*\*\*  
FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 355.00  
DOWNSTREAM NODE ELEVATION = 354.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 1.000  
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 5.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 4.02  
FLOW VELOCITY(FEET/SEC) = 1.46 FLOW DEPTH(FEET) = 1.66  
TRAVEL TIME(MIN.) = 6.86 TC(MIN.) = 31.66

\*\*\*\*\*  
FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.083  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 8.66 SUBAREA RUNOFF(CFS) = 9.92

TOTAL AREA(ACRES) = 11.66 TOTAL RUNOFF(CFS) = 13.94  
 TC(MIN) = 31.66

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 13.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 24.0 INCH PIPE IS 19.5 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 5.1

UPSTREAM NODE ELEVATION = 354.00

DOWNSTRM NODE ELEVATION = 348.00

FLOWLENGTH(FEET) = 1400.00 MANNINGS N = .013

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

PIPEFLOW THRU SUBAREA(CFS) = 13.94

TRAVEL TIME(MIN.) = 4.58 TC(MIN.) = 36.23

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 13.00 TO NODE 15.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.910

SOIL CLASSIFICATION IS "D"

INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500

SUBAREA AREA(ACRES) = 19.52 SUBAREA RUNOFF(CFS) = 35.41

TOTAL AREA(ACRES) = 31.18 TOTAL RUNOFF(CFS) = 49.35

TC(MIN) = 36.23

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 1

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

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 36.23

RAINFALL INTENSITY (INCH./HOUR) = 1.91

TOTAL STREAM AREA (ACRES) = 31.18

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 49.35

#### CONFLUENCE INFORMATION:

| STREAM NUMBER | RUNOFF (CFS) | TIME (MIN.) | INTENSITY (INCH/HOUR) |
|---------------|--------------|-------------|-----------------------|
|---------------|--------------|-------------|-----------------------|

|   |       |       |       |
|---|-------|-------|-------|
| 1 | 60.68 | 14.28 | 3.482 |
| 2 | 49.35 | 36.23 | 1.910 |

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS

VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

87.75 82.63

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 87.75 TIME(MINUTES) = 14.275  
TOTAL AREA(ACRES) = 46.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 42.0 INCH PIPE IS 30.7 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 11.6

UPSTREAM NODE ELEVATION = 348.00

DOWNTSTREAM NODE ELEVATION = 340.00

FLOWLENGTH(FEET) = 740.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 87.75

TRAVEL TIME(MIN.) = 1.06 TC(MIN.) = 15.33

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.325

SOIL CLASSIFICATION IS "D"

INDUSTRIAL DEVELOPMENT RUNOFF COEFFICIENT = .9500

SUBAREA AREA(ACRES) = 8.75 SUBAREA RUNOFF(CFS) = 27.64

TOTAL AREA(ACRES) = 55.61 TOTAL RUNOFF(CFS) = 115.39

TC(MIN) = 15.33

=====  
END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985, 1981 HYDROLOGY MANUAL

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**Especially prepared for:**

**BSI CONSULTANTS**

\*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*

\* CITY OF SANTEE  
\* 100-YEAR RUNOFF  
\* BASIN S

JANUARY 1990 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.600

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 5.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

-----  
-----

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 19.41 RAIN INTENSITY(INCH/HOUR) = 2.86  
TOTAL AREA(ACRES) = 8.96 TOTAL RUNOFF(CFS) = 21.75

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 342.00 DOWNSTREAM ELEVATION = 336.00  
STREET LENGTH(FEET) = 670.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200  
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 25.07  
\*\*\*STREET FLOWING FULL\*\*\*

STREET FLOWDEPTH(FEET) = .49  
HALFSTREET FLOODWIDTH(FEET) = 15.00  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.69  
PRODUCT OF DEPTH&VELOCITY = 1.83

STREETFLOW TRAVELTIME(MIN) = 3.02 TC(MIN) = 22.43

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.602

SOIL CLASSIFICATION IS "D"

COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 3.00 SUBAREA RUNOFF(CFS) = 6.63  
SUMMED AREA(ACRES) = 11.96 TOTAL RUNOFF(CFS) = 28.38  
END OF SUBAREA STREETFLOW HYDRAULICS:  
DEPTH(FEET) = .51 HALFSTREET FLOODWIDTH(FEET) = 15.00  
FLOW VELOCITY(FEET/SEC.) = 3.85 DEPTH\*VELOCITY = 1.98

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 6  
-----

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 336.00 DOWNSTREAM ELEVATION = 333.00  
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200  
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2

\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 38.66  
\*\*\*STREET FLOWING FULL\*\*\*

NOTE: STREETFLOW EXCEEDS TOP OF CURB.

THE FOLLOWING STREETFLOW RESULTS ARE BASED ON THE ASSUMPTION  
THAT NEGLIBLE FLOW OCCURS OUTSIDE OF THE STREET CHANNEL.  
THAT IS, ALL FLOW ALONG THE PARKWAY, ETC., IS NEGLECTED.

STREET FLOWDEPTH(FEET) = .67  
HALFSTREET FLOODWIDTH(FEET) = 15.00  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.21  
PRODUCT OF DEPTH&VELOCITY = 2.15

STREETFLOW TRAVELTIME(MIN) = 5.20 TC(MIN) = 27.63

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.274

SOIL CLASSIFICATION IS "D"

COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 10.62 SUBAREA RUNOFF(CFS) = 20.53  
SUMMED AREA(ACRES) = 22.58 TOTAL RUNOFF(CFS) = 48.91

## END OF SUBAREA STREETFLOW HYDRAULICS:

DEPTH(FEET) = .75 HALFSTREET FLOODWIDTH(FEET) = 15.00  
FLOW VELOCITY(FEET/SEC.) = 3.40 DEPTH\*VELOCITY = 2.54

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 39.0 INCH PIPE IS 28.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 7.7  
UPSTREAM NODE ELEVATION = 333.00  
DOWNSTREAM NODE ELEVATION = 325.00  
FLOWLENGTH(FEET) = 1530.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 48.91  
TRAVEL TIME(MIN.) = 3.32 TC(MIN.) = 30.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.114  
SOIL CLASSIFICATION IS "D"  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 10.89 SUBAREA RUNOFF(CFS) = 19.57  
TOTAL AREA(ACRES) = 33.47 TOTAL RUNOFF(CFS) = 68.48  
TC(MIN) = 30.95

\*\*\*\*\*  
FLOW PROCESS FROM NODE 21.00 TO NODE 25.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 14.74 RAIN INTENSITY(INCH/HOUR) = 3.41  
TOTAL AREA(ACRES) = 8.04 TOTAL RUNOFF(CFS) = 22.31

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 5.7  
UPSTREAM NODE ELEVATION = 336.00  
DOWNSTREAM NODE ELEVATION = 335.00  
FLOWLENGTH(FEET) = 250.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 22.31  
TRAVEL TIME(MIN.) = .73 TC(MIN.) = 15.47

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.306  
SOIL CLASSIFICATION IS "D"  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 8.97 SUBAREA RUNOFF(CFS) = 25.20  
TOTAL AREA(ACRES) = 17.01 TOTAL RUNOFF(CFS) = 47.51  
TC(MIN) = 15.47

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 42.0 INCH PIPE IS 33.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 5.8  
UPSTREAM NODE ELEVATION = 335.00  
DOWNSTREAM NODE ELEVATION = 330.00  
FLOWLENGTH(FEET) = 1900.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 47.51  
TRAVEL TIME(MIN.) = 5.46 TC(MIN.) = 20.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.720  
SOIL CLASSIFICATION IS "D"  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 43.20 SUBAREA RUNOFF(CFS) = 99.88  
TOTAL AREA(ACRES) = 60.21 TOTAL RUNOFF(CFS) = 147.40  
TC(MIN) = 20.93

\*\*\*\*\*  
FLOW PROCESS FROM NODE 36.00 TO NODE 40.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<  
=====  
USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 29.21 RAIN INTENSITY(INCH/HOUR) = 2.19  
TOTAL AREA(ACRES) = 4.09 TOTAL RUNOFF(CFS) = 4.94

\*\*\*\*\*  
FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000  
DEPTH OF FLOW IN 24.0 INCH PIPE IS 10.9 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 3.6  
UPSTREAM NODE ELEVATION = 325.00  
DOWNSTREAM NODE ELEVATION = 320.00  
FLOWLENGTH(FEET) = 1700.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 4.94  
TRAVEL TIME(MIN.) = 7.98 TC(MIN.) = 37.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.878  
SOIL CLASSIFICATION IS "D"  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
SUBAREA AREA(ACRES) = 27.96 SUBAREA RUNOFF(CFS) = 44.63  
TOTAL AREA(ACRES) = 32.05 TOTAL RUNOFF(CFS) = 49.57  
TC(MIN) = 37.19

=====

END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985-1981 HYDROLOGY MANUAL

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Especially prepared for:

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## \*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*

- \* CITY OF SANTEE
- \* 100-YEAR RUNOFF
- \* BASIN T

SEPTEMBER 1989 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

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VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

## >>> NATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<

SOIL CLASSIFICATION IS "D"

SOIL CLASSIFICATION IS B  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

## NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.70(MINUTES)  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 590.00  
UPSTREAM ELEVATION = 765.00  
DOWNSTREAM ELEVATION = 590.00  
ELEVATION DIFFERENCE = 175.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.807  
SUBAREA RUNOFF(CFS) = 6.89  
TOTAL AREA(ACRES) = 4.02 TOTAL RUNOFF(CFS) = 6.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 590.00  
DOWNSTREAM NODE ELEVATION = 430.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1350.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 6.89  
FLOW VELOCITY(FEET/SEC) = 3.79 FLOW DEPTH(FEET) = .18  
TRAVEL TIME(MIN.) = 5.94 TC(MIN.) = 17.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
\*\*\*\*\*  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.921  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 42.81 SUBAREA RUNOFF(CFS) = 56.27  
TOTAL AREA(ACRES) = 46.83 TOTAL RUNOFF(CFS) = 63.16  
TC(MIN) = 17.64

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 430.00  
DOWNSTREAM NODE ELEVATION = 404.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 63.16  
FLOW VELOCITY(FEET/SEC) = 8.12 FLOW DEPTH(FEET) = 1.97  
TRAVEL TIME(MIN.) = 1.23 TC(MIN.) = 18.87

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.796  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 23.20 SUBAREA RUNOFF(CFS) = 35.68  
TOTAL AREA(ACRES) = 70.03 TOTAL RUNOFF(CFS) = 98.84  
TC(MIN) = 18.87

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>>TRAVELTIME THRU SUBAREA<<<  
=====  
UPSTREAM NODE ELEVATION = 404.00  
DOWNSTREAM NODE ELEVATION = 368.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 98.84  
FLOW VELOCITY(FEET/SEC) = 7.79 FLOW DEPTH(FEET) = 2.52  
TRAVEL TIME(MIN.) = 2.78 TC(MIN.) = 21.66

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.559  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 29.90 SUBAREA RUNOFF(CFS) = 42.08  
TOTAL AREA(ACRES) = 99.93 TOTAL RUNOFF(CFS) = 140.92  
TC(MIN) = 21.66

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>>TRAVELTIME THRU SUBAREA<<<  
=====  
UPSTREAM NODE ELEVATION = 368.00  
DOWNSTREAM NODE ELEVATION = 340.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1200.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 140.92  
FLOW VELOCITY(FEET/SEC) = 7.89 FLOW DEPTH(FEET) = 2.99

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Page 4

TRAVEL TIME(MIN.) = 2.53 TC(MIN.) = 24.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8  
----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.383  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 53.52 SUBAREA RUNOFF(CFS) = 70.14  
TOTAL AREA(ACRES) = 153.45 TOTAL RUNOFF(CFS) = 211.06  
TC(MIN) = 24.19  
=====  
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985, 1981 HYDROLOGY MANUAL

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## \*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*

\* CITY OF SANTEE  
\* 100-YEAR RUNOFF  
\* BASIN U

SEPTEMBER 1989 \*

**USER-SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

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VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 7

>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 10.62 RAIN INTENSITY(INCH/HOUR) = 4.05  
TOTAL AREA(ACRES) = 4.69 TOTAL RUNOFF(CFS) = 10.45



\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====  
UPSTREAM NODE ELEVATION = 425.00  
DOWNSTREAM NODE ELEVATION = 375.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 510.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 10.45  
FLOW VELOCITY(FEET/SEC) = 4.66 FLOW DEPTH(FEET) = .21  
TRAVEL TIME(MIN.) = 1.82 TC(MIN.) = 12.44

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8  
-----

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

=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.658  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 10.10 SUBAREA RUNOFF(CFS) = 20.32  
TOTAL AREA(ACRES) = 14.79 TOTAL RUNOFF(CFS) = 30.77  
TC(MIN) = 12.44

\*\*\*\*\*  
FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====  
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.3  
UPSTREAM NODE ELEVATION = 375.00  
DOWNSTREAM NODE ELEVATION = 344.00  
FLOWLENGTH(FEET) = 850.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 30.77  
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 13.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 8  
-----

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

=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.492  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 17.52 SUBAREA RUNOFF(CFS) = 33.56  
TOTAL AREA(ACRES) = 32.31 TOTAL RUNOFF(CFS) = 64.33  
TC(MIN) = 13.43

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 36.0 INCH PIPE IS 28.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 10.9  
UPSTREAM NODE ELEVATION = 344.00  
DOWNSTREAM NODE ELEVATION = 334.00  
FLOWLENGTH(FEET) = 870.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 64.33  
TRAVEL TIME(MIN.) = 1.33 TC(MIN.) = 14.76

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.277  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 25.50 SUBAREA RUNOFF(CFS) = 45.96  
TOTAL AREA(ACRES) = 57.81 TOTAL RUNOFF(CFS) = 110.29  
TC(MIN) = 14.76

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.7 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 15.2  
UPSTREAM NODE ELEVATION = 334.00  
DOWNSTREAM NODE ELEVATION = 321.00  
FLOWLENGTH(FEET) = 700.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 110.29  
TRAVEL TIME(MIN.) = .77 TC(MIN.) = 15.53

=====  
END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
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## \*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*

\* CITY OF SANTEE  
\* 100-YEAR RUNOFF  
\* BASIN V

SEPTEMBER 1989 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 7

>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<:

----- USED SPECIFIED VALUES ARE AS FOLLOWS:

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 12.16 RAIN INTENSITY(INCH/HOUR) = 3.71  
TOTAL AREA(ACRES) = 8.00 TOTAL RUNOFF(CFS) = 16.34

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<  
UPSTREAM ELEVATION = 700.00 DOWNSTREAM ELEVATION = 655.00  
STREET LENGTH(FEET) = 600.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200  
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2  
\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 43.35  
\*\*\*STREET FLOWING FULL\*\*\*  
STREET FLOWDEPTH(FEET) = .44  
HALFSTREET FLOODWIDTH(FEET) = 15.00  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 8.62  
PRODUCT OF DEPTH&VELOCITY = 3.76  
STREETFLOW TRAVELTIME(MIN) = 1.16 TC(MIN) = 13.32

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.501  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 28.00 SUBAREA RUNOFF(CFS) = 53.92  
SUMMED AREA(ACRES) = 36.00 TOTAL RUNOFF(CFS) = 70.26  
END OF SUBAREA STREETFLOW HYDRAULICS:  
DEPTH(FEET) = .49 HALFSTREET FLOODWIDTH(FEET) = 15.00  
FLOW VELOCITY(FEET/SEC.) = 10.35 DEPTH\*VELOCITY = 5.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 3  
>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.5  
UPSTREAM NODE ELEVATION = 655.00  
DOWNSTREAM NODE ELEVATION = 510.00  
FLOWLENGTH(FEET) = 2650.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 70.26  
TRAVEL TIME(MIN.) = 2.16 TC(MIN.) = 15.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 8  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.178  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 132.70 SUBAREA RUNOFF(CFS) = 231.94  
TOTAL AREA(ACRES) = 168.70 TOTAL RUNOFF(CFS) = 302.20

TC(MIN) = 15.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====

DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 23.1  
UPSTREAM NODE ELEVATION = 510.00  
DOWNSTREAM NODE ELEVATION = 483.00  
FLOWLENGTH(FEET) = 900.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 302.20  
TRAVEL TIME(MIN.) = .65 TC(MIN.) = 16.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.095  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 131.10 SUBAREA RUNOFF(CFS) = 223.15  
TOTAL AREA(ACRES) = 299.80 TOTAL RUNOFF(CFS) = 525.34  
TC(MIN) = 16.13

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====

DEPTH OF FLOW IN 84.0 INCH PIPE IS 62.8 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 17.0  
UPSTREAM NODE ELEVATION = 483.00  
DOWNSTREAM NODE ELEVATION = 480.00  
FLOWLENGTH(FEET) = 330.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 84.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 525.34  
TRAVEL TIME(MIN.) = .32 TC(MIN.) = 16.45

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8  
-----

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.055  
SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 154.80 SUBAREA RUNOFF(CFS) = 260.14  
TOTAL AREA(ACRES) = 454.60 TOTAL RUNOFF(CFS) = 785.48  
TC(MIN) = 16.45

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<

DEPTH OF FLOW IN 87.0 INCH PIPE IS 70.3 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 22.0  
UPSTREAM NODE ELEVATION = 480.00  
DOWNSTREAM NODE ELEVATION = 475.00  
FLOWLENGTH(FEET) = 350.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 87.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 785.48  
TRAVEL TIME(MIN.) = .27 TC(MIN.) = 16.72

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.024  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 130.67 SUBAREA RUNOFF(CFS) = 217.33  
TOTAL AREA(ACRES) = 585.27 TOTAL RUNOFF(CFS) = 1002.81  
TC(MIN) = 16.72

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
>>>>TRAVELTIME THRU SUBAREA<<<

UPSTREAM NODE ELEVATION = 475.00  
DOWNSTREAM NODE ELEVATION = 402.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2700.00  
CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1002.81  
FLOW VELOCITY(FEET/SEC) = 25.86 FLOW DEPTH(FEET) = 4.16  
TRAVEL TIME(MIN.) = 1.74 TC(MIN.) = 18.46

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

```
=====
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.837
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 69.29 SUBAREA RUNOFF(CFS) = 108.11
 TOTAL AREA(ACRES) = 654.56 TOTAL RUNOFF(CFS) = 1110.92
 TC(MIN) = 18.46

*****
 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 5
-----
 >>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<
=====
 UPSTREAM NODE ELEVATION = 402.00
 DOWNSTREAM NODE ELEVATION = 374.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1550.00
 CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 1110.92
 FLOW VELOCITY(FEET/SEC) = 22.75 FLOW DEPTH(FEET) = 4.94
 TRAVEL TIME(MIN.) = 1.14 TC(MIN.) = 19.59

*****
 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8
-----
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.730
 SOIL CLASSIFICATION IS "D"
 SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
 SUBAREA AREA(ACRES) = 134.29 SUBAREA RUNOFF(CFS) = 201.62
 TOTAL AREA(ACRES) = 788.85 TOTAL RUNOFF(CFS) = 1312.54
 TC(MIN) = 19.59

*****
 FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 5
-----
 >>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<
=====
 UPSTREAM NODE ELEVATION = 374.00
 DOWNSTREAM NODE ELEVATION = 350.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1780.00
 CHANNEL BASE(FEET) = 4.00 "Z" FACTOR = 1.500
 MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 1312.54

==>>ERROR: 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.

FLOW VELOCITY(FEET/SEC) = 22.83 FLOW DEPTH(FEET) = 5.00  
TRAVEL TIME(MIN.) = 1.30 TC(MIN.) = 20.89

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.619  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 47.20 SUBAREA RUNOFF(CFS) = 67.99  
TOTAL AREA(ACRES) = 836.05 TOTAL RUNOFF(CFS) = 1380.53  
TC(MIN) = 20.89

\*\*\*\*\*  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 5  
-----  
>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
=====  
UPSTREAM NODE ELEVATION = 350.00  
DOWNSTREAM NODE ELEVATION = 342.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 680.00  
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 1.500  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 5.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1380.53  
  
==>ERROR: 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.

FLOW VELOCITY(FEET/SEC) = 22.09 FLOW DEPTH(FEET) = 5.00  
TRAVEL TIME(MIN.) = .51 TC(MIN.) = 21.40

==>FLOWDEPTH EXCEEDS MAXIMUM ALLOWABLE DEPTH

\*\*\*\*\*  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8  
-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.578  
SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 4.33 SUBAREA RUNOFF(CFS) = 6.14  
TOTAL AREA(ACRES) = 840.38 TOTAL RUNOFF(CFS) = 1386.67  
TC(MIN) = 21.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 342.00  
DOWNSTREAM NODE ELEVATION = 329.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1260.00.  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1386.67  
FLOW VELOCITY(FEET/SEC) = 19.28 FLOW DEPTH(FEET) = 6.00  
TRAVEL TIME(MIN.) = 1.09 TC(MIN.) = 22.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.497  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 62.44 SUBAREA RUNOFF(CFS) = 85.75  
TOTAL AREA(ACRES) = 902.82 TOTAL RUNOFF(CFS) = 1472.42  
TC(MIN) = 22.49

=====  
END OF RATIONAL METHOD ANALYSIS



BASIN\_W

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985-1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

## \*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*

\* CITY OF SANTEE  
\* 100-YEAR RUNOFF  
\* BASIN W  
\*\*\*\*\*

SEPTEMBER 1989 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00      6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.29(MINUTES)  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 800.00  
UPSTREAM ELEVATION = 750.00  
DOWNSTREAM ELEVATION = 550.00  
ELEVATION DIFFERENCE = 200.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.688  
SUBAREA RUNOFF(CFS) = 13.61  
TOTAL AREA(ACRES) = 8.20 TOTAL RUNOFF(CFS) = 13.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 550.00  
DOWNSTREAM NODE ELEVATION = 378.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1850.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 13.61  
FLOW VELOCITY(FEET/SEC) = 16.38 FLOW DEPTH(FEET) = .64  
TRAVEL TIME(MIN.) = 1.88 TC(MIN.) = 14.17

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.364  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 50.50 SUBAREA RUNOFF(CFS) = 76.44  
TOTAL AREA(ACRES) = 58.70 TOTAL RUNOFF(CFS) = 90.05  
TC(MIN) = 14.17

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 36.0 INCH PIPE IS 26.0 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.5  
UPSTREAM NODE ELEVATION = 378.00  
DOWNSTREAM NODE ELEVATION = 370.00  
FLOWLENGTH(FEET) = 300.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 90.05  
TRAVEL TIME(MIN.) = .30 TC(MIN.) = 14.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.318  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 16.50 SUBAREA RUNOFF(CFS) = 30.11  
TOTAL AREA(ACRES) = 75.20 TOTAL RUNOFF(CFS) = 120.16  
TC(MIN) = 14.48

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====  
DEPTH OF FLOW IN 36.0 INCH PIPE IS 27.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 20.8  
UPSTREAM NODE ELEVATION = 370.00  
DOWNSTREAM NODE ELEVATION = 347.00  
FLOWLENGTH(FEET) = 550.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 120.16  
TRAVEL TIME(MIN.) = .44 TC(MIN.) = 14.92

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.255  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 5.70 SUBAREA RUNOFF(CFS) = 10.20  
TOTAL AREA(ACRES) = 80.90 TOTAL RUNOFF(CFS) = 130.36  
TC(MIN) = 14.92

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<  
=====  
DEPTH OF FLOW IN 39.0 INCH PIPE IS 31.2 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 18.3  
UPSTREAM NODE ELEVATION = 347.00  
DOWNSTREAM NODE ELEVATION = 318.00  
FLOWLENGTH(FEET) = 1000.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 130.36

TRAVEL TIME(MIN.) = .91 TC(MIN.) = 15.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.133

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 3.40 SUBAREA RUNOFF(CFS) = 5.86

TOTAL AREA(ACRES) = 84.30 TOTAL RUNOFF(CFS) = 136.22

TC(MIN) = 15.83

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.79(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00

UPSTREAM ELEVATION = 450.00

DOWNTSTREAM ELEVATION = 370.00

ELEVATION DIFFERENCE = 80.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.594

SUBAREA RUNOFF(CFS) = 5.98

TOTAL AREA(ACRES) = 3.70 TOTAL RUNOFF(CFS) = 5.98

\*\*\*\*\*  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 370.00

DOWNTSTREAM NODE ELEVATION = 355.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 600.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 5.98

FLOW VELOCITY(FEET/SEC) = 3.55 FLOW DEPTH(FEET) = .92

TRAVEL TIME(MIN.) = 2.82 TC(MIN.) = 15.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.161  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 15.40 SUBAREA RUNOFF(CFS) = 21.90  
TOTAL AREA(ACRES) = 19.10 TOTAL RUNOFF(CFS) = 27.89  
TC(MIN) = 15.61

\*\*\*\*\*  
FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 355.00  
DOWNSTREAM NODE ELEVATION = 319.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1750.00  
CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .035 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 27.89  
FLOW VELOCITY(FEET/SEC) = 5.06 FLOW DEPTH(FEET) = 1.66  
TRAVEL TIME(MIN.) = 5.77 TC(MIN.) = 21.37

\*\*\*\*\*  
FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
\*\*\*\*\*  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.581  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 16.62 SUBAREA RUNOFF(CFS) = 23.59  
TOTAL AREA(ACRES) = 35.72 TOTAL RUNOFF(CFS) = 51.48  
TC(MIN) = 21.37

\*\*\*\*\*  
FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<  
\*\*\*\*\*  
USER-SPECIFIED VALUES ARE AS FOLLOWS:  
TC(MIN) = 16.70 RAIN INTENSITY(INCH/HOUR) = 3.03  
TOTAL AREA(ACRES) = 4.11 TOTAL RUNOFF(CFS) = 6.84

\*\*\*\*\*  
FLOW PROCESS FROM NODE 55.00 TO NODE 60.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM ELEVATION = 353.00 DOWNSTREAM ELEVATION = 329.00  
STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2  
\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 18.39  
STREET FLOWDEPTH(FEET) = .42  
HALFSTREET FLOODWIDTH(FEET) = 14.58  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.10  
PRODUCT OF DEPTH&VELOCITY = 1.71  
STREETFLOW TRAVELTIME(MIN) = 4.07 TC(MIN) = 20.77

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.629  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 15.81 SUBAREA RUNOFF(CFS) = 22.86  
SUMMED AREA(ACRES) = 19.92 TOTAL RUNOFF(CFS) = 29.70  
END OF SUBAREA STREETFLOW HYDRAULICS:  
DEPTH(FEET) = .46 HALFSTREET FLOODWIDTH(FEET) = 15.00  
FLOW VELOCITY(FEET/SEC.) = 5.29 DEPTH\*VELOCITY = 2.41

\*\*\*\*\*  
FLOW PROCESS FROM NODE 60.00 TO NODE 65.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 9.4  
UPSTREAM NODE ELEVATION = 329.00  
DOWNSTREAM NODE ELEVATION = 319.00  
FLOWLENGTH(FEET) = 800.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 29.70  
TRAVEL TIME(MIN.) = 1.43 TC(MIN.) = 22.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 60.00 TO NODE 65.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.519  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 20.63 SUBAREA RUNOFF(CFS) = 28.58  
TOTAL AREA(ACRES) = 40.55 TOTAL RUNOFF(CFS) = 58.28  
TC(MIN) = 22.19

\*\*\*\*\*  
FLOW PROCESS FROM NODE 65.00 TO NODE 65.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MINUTES) = 22.19  
RAINFALL INTENSITY (INCH./HOUR) = 2.52

TOTAL STREAM AREA (ACRES) = 40.55  
TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 58.28

\*\*\*\*\*  
FLOW PROCESS FROM NODE 61.00 TO NODE 62.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 18.80 RAIN INTENSITY(INCH/HOUR) = 2.80  
TOTAL AREA(ACRES) = 4.33 TOTAL RUNOFF(CFS) = 6.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 62.00 TO NODE 63.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 328.00 DOWNSTREAM ELEVATION = 318.00  
STREET LENGTH(FEET) = 400.00 CURB HEIGHT(INCHES) = 6.  
STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200  
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2  
\*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 9.17  
STREET FLOWDEPTH(FEET) = .33  
HALFSTREET FLOODWIDTH(FEET) = 10.36  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.85  
PRODUCT OF DEPTH&VELOCITY = 1.28  
STREETFLOW TRAVELTIME(MIN) = 1.73 TC(MIN) = 20.53

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.648

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 3.41 SUBAREA RUNOFF(CFS) = 4.97  
SUMMED AREA(ACRES) = 7.74 TOTAL RUNOFF(CFS) = 11.65  
END OF SUBAREA STREETFLOW HYDRAULICS:  
DEPTH(FEET) = .37 HALFSTREET FLOODWIDTH(FEET) = 12.05  
FLOW VELOCITY(FEET/SEC.) = 3.71 DEPTH\*VELOCITY = 1.36

\*\*\*\*\*  
FLOW PROCESS FROM NODE 63.00 TO NODE 65.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

DEPTH OF FLOW IN 27.0 INCH PIPE IS 17.1 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 4.4  
UPSTREAM NODE ELEVATION = 318.00  
DOWNSTREAM NODE ELEVATION = 316.00  
FLOWLENGTH(FEET) = 680.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 11.65  
TRAVEL TIME(MIN.) = 2.59 TC(MIN.) = 23.12

\*\*\*\*\*  
FLOW PROCESS FROM NODE 65.00 TO NODE 65.00 IS CODE = 1

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

===== CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MINUTES) = 23.12

RAINFALL INTENSITY (INCH./HOUR) = 2.45

TOTAL STREAM AREA (ACRES) = 7.74

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 11.65

CONFLUENCE INFORMATION:

| STREAM NUMBER | RUNOFF (CFS) | TIME (MIN.) | INTENSITY (INCH/HOUR) |
|---------------|--------------|-------------|-----------------------|
|---------------|--------------|-------------|-----------------------|

|   |       |       |       |
|---|-------|-------|-------|
| 1 | 58.28 | 22.19 | 2.519 |
| 2 | 11.65 | 23.12 | 2.453 |

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS  
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

69.63 68.40

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 69.63 TIME(MINUTES) = 22.192

TOTAL AREA(ACRES) = 48.29

===== END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985-1981 HYDROLOGY MANUAL

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Especially prepared for:

BSI CONSULTANTS

\*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*  
\* CITY OF SANTEE \*  
\* 100-YEAR RUNOFF \*  
\* BASIN X \* SEPTEMBER 1989 \*

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

## 1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
=====  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.99(MINUTES)  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 400.00  
UPSTREAM ELEVATION = 776.00  
DOWNSTREAM ELEVATION = 740.00  
ELEVATION DIFFERENCE = 36.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.747  
SUBAREA RUNOFF(CFS) = 16.86  
TOTAL AREA(ACRES) = 10.00 TOTAL RUNOFF(CFS) = 16.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 740.00  
DOWNSTREAM NODE ELEVATION = 575.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2900.00  
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 16.86  
FLOW VELOCITY(FEET/SEC) = 5.28 FLOW DEPTH(FEET) = .53  
TRAVEL TIME(MIN.) = 9.15 TC(MIN.) = 21.14

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
\*\*\*\*\*  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.599  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 95.30 SUBAREA RUNOFF(CFS) = 111.45  
TOTAL AREA(ACRES) = 105.30 TOTAL RUNOFF(CFS) = 128.31  
TC(MIN) = 21.14

\*\*\*\*\*  
FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 575.00  
DOWNSTREAM NODE ELEVATION = 410.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 3850.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 5.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 128.31  
FLOW VELOCITY(FEET/SEC) = 7.77 FLOW DEPTH(FEET) = 1.31  
TRAVEL TIME(MIN.) = 8.26 TC(MIN.) = 29.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 3.00 TO NODE 5.00 IS CODE = 8  
-----

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

=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.101  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 441.80 SUBAREA RUNOFF(CFS) = 417.71  
TOTAL AREA(ACRES) = 547.10 TOTAL RUNOFF(CFS) = 546.02  
TC(MIN) = 29.40

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====  
UPSTREAM NODE ELEVATION = 410.00  
DOWNSTREAM NODE ELEVATION = 375.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1250.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 5.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 546.02  
FLOW VELOCITY(FEET/SEC) = 10.30 FLOW DEPTH(FEET) = 3.22  
TRAVEL TIME(MIN.) = 2.02 TC(MIN.) = 31.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8  
-----

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

=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.013  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 442.70 SUBAREA RUNOFF(CFS) = 400.98  
TOTAL AREA(ACRES) = 989.80 TOTAL RUNOFF(CFS) = 947.01  
TC(MIN) = 31.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 5  
-----

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

=====  
UPSTREAM NODE ELEVATION = 375.00  
DOWNSTREAM NODE ELEVATION = 335.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1300.00  
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 947.01  
FLOW VELOCITY(FEET/SEC) = 25.52 FLOW DEPTH(FEET) = 2.48

TRAVEL TIME(MIN.) = .85 TC(MIN.) = 32.27

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8  
\*\*\*\*\*

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.978

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 56.00 SUBAREA RUNOFF(CFS) = 60.94

TOTAL AREA(ACRES) = 1045.80 TOTAL RUNOFF(CFS) = 1007.94

TC(MIN) = 32.27

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 5  
\*\*\*\*\*

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 335.00

DOWNTSTREAM NODE ELEVATION = 323.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 300.00

CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .013 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 1007.94

FLOW VELOCITY(FEET/SEC) = 29.78 FLOW DEPTH(FEET) = 1.82

TRAVEL TIME(MIN.) = .17 TC(MIN.) = 32.44

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8  
\*\*\*\*\*

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.972

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 12.70 SUBAREA RUNOFF(CFS) = 13.77

TOTAL AREA(ACRES) = 1058.50 TOTAL RUNOFF(CFS) = 1021.72

TC(MIN) = 32.44

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 5  
\*\*\*\*\*

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 323.00

DOWNTSTREAM NODE ELEVATION = 315.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1100.00

CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 10.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 1021.72  
FLOW VELOCITY(FEET/SEC) = 14.78 FLOW DEPTH(FEET) = 3.22  
TRAVEL TIME(MIN.) = 1.24 TC(MIN.) = 33.68

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.925  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 25.00 SUBAREA RUNOFF(CFS) = 26.47  
TOTAL AREA(ACRES) = 1083.50 TOTAL RUNOFF(CFS) = 1048.18  
TC(MIN) = 33.68

=====  
END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985, 1981 HYDROLOGY MANUAL

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**Especially prepared for:**

BSI CONSULTANTS

\*\*\*\*\*DESCRIPTION OF RESULTS

- \* CITY OF SANTEE
  - \* 100-YEAR RUNOFF
  - \* BASIN Y

OCTOBER 1989 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

## **1985 SAN DIEGO MANUAL CRITERIA**

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE (INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

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

**SOIL CLASSIFICATION IS "D"**

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

## NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

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WITH 10-MINUTES ADDED = 12.43(MINUTES)  
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 600.00  
 UPSTREAM ELEVATION = 1272.00  
 DOWNSTREAM ELEVATION = 1200.00  
 ELEVATION DIFFERENCE = 72.00  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.660  
 SUBAREA RUNOFF(CFS) = 16.47  
 TOTAL AREA(ACRES) = 10.00 TOTAL RUNOFF(CFS) = 16.47

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<  
 =====  
 UPSTREAM NODE ELEVATION = 1200.00  
 DOWNSTREAM NODE ELEVATION = 640.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 3600.00  
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000  
 MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 16.47  
 FLOW VELOCITY(FEET/SEC) = 6.90 FLOW DEPTH(FEET) = .41  
 TRAVEL TIME(MIN.) = 8.70 TC(MIN.) = 21.13

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<  
 =====  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.600  
 SOIL CLASSIFICATION IS "D"  
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
 SUBAREA AREA(ACRES) = 136.50 SUBAREA RUNOFF(CFS) = 159.69  
 TOTAL AREA(ACRES) = 146.50 TOTAL RUNOFF(CFS) = 176.16  
 TC(MIN) = 21.13

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<  
 =====  
 UPSTREAM NODE ELEVATION = 640.00  
 DOWNSTREAM NODE ELEVATION = 470.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 1100.00  
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000  
 MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 10.00  
 CHANNEL FLOW THRU SUBAREA(CFS) = 176.16  
 FLOW VELOCITY(FEET/SEC) = 14.63 FLOW DEPTH(FEET) = 1.50  
 TRAVEL TIME(MIN.) = 1.25 TC(MIN.) = 22.38

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.505  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 73.80 SUBAREA RUNOFF(CFS) = 83.19  
TOTAL AREA(ACRES) = 220.30 TOTAL RUNOFF(CFS) = 259.35  
TC(MIN) = 22.38

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 45.0 INCH PIPE IS 33.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 29.5  
UPSTREAM NODE ELEVATION = 470.00  
DOWNSTREAM NODE ELEVATION = 360.00  
FLOWLENGTH(FEET) = 1750.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 45.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 259.35  
TRAVEL TIME(MIN.) = .99 TC(MIN.) = 23.37

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.436  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 14.20 SUBAREA RUNOFF(CFS) = 19.03  
TOTAL AREA(ACRES) = 234.50 TOTAL RUNOFF(CFS) = 278.38  
TC(MIN) = 23.37

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 3  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<  
=====  
DEPTH OF FLOW IN 51.0 INCH PIPE IS 38.5 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 24.2  
UPSTREAM NODE ELEVATION = 360.00  
DOWNSTREAM NODE ELEVATION = 335.00  
FLOWLENGTH(FEET) = 700.00 MANNINGS N = .013  
ESTIMATED PIPE DIAMETER(INCH) = 51.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 278.38

BASIN\_Y

TRAVEL TIME(MIN.) = .48 TC(MIN.) = 23.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 15.00 TO NODE 20.00 IS CODE = 8  
-----

&gt;&gt;&gt;&gt;ADDITION OF SUBAREA TO MAINLINE PEAK FLOW&lt;&lt;&lt;&lt;

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.404

SOIL CLASSIFICATION IS "D"

MOBILE HOME DEVELOPMENT RUNOFF COEFFICIENT = .6500

SUBAREA AREA(ACRES) = 18.40 SUBAREA RUNOFF(CFS) = 28.75

TOTAL AREA(ACRES) = 252.90 TOTAL RUNOFF(CFS) = 307.13

TC(MIN) = 23.86

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 3  
-----

&gt;&gt;&gt;&gt;COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA&lt;&lt;&lt;&lt;

&gt;&gt;&gt;&gt;USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)&lt;&lt;&lt;&lt;

===== DEPTH OF FLOW IN 54.0 INCH PIPE IS 41.5 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 23.4

UPSTREAM NODE ELEVATION = 335.00

DOWNSTREAM NODE ELEVATION = 318.00

FLOWLENGTH(FEET) = 550.00 MANNINGS N = .013

ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 307.13

TRAVEL TIME(MIN.) = .39 TC(MIN.) = 24.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 25.00 IS CODE = 8  
-----

&gt;&gt;&gt;&gt;ADDITION OF SUBAREA TO MAINLINE PEAK FLOW&lt;&lt;&lt;&lt;

===== 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.379

SOIL CLASSIFICATION IS "D"

MOBILE HOME DEVELOPMENT RUNOFF COEFFICIENT = .6500

SUBAREA AREA(ACRES) = 5.90 SUBAREA RUNOFF(CFS) = 9.12

TOTAL AREA(ACRES) = 258.80 TOTAL RUNOFF(CFS) = 316.26

TC(MIN) = 24.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 4  
-----

&gt;&gt;&gt;&gt;COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA&lt;&lt;&lt;&lt;

&gt;&gt;&gt;&gt;USING USER-SPECIFIED PIPESIZE&lt;&lt;&lt;&lt;

===== PIPEFLOW VELOCITY(FEET/SEC.) = 16.4

UPSTREAM NODE ELEVATION = 318.00

DOWNSTREAM NODE ELEVATION = 310.00

FLOWLENGTH(FEET) = 100.00 MANNINGS N = .024

GIVEN PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 2  
 PIPEFLOW THRU SUBAREA(CFS) = 316.26  
 TRAVEL TIME(MIN.) = .10 TC(MIN.) = 24.35

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.373  
 SOIL CLASSIFICATION IS "D"  
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500  
 SUBAREA AREA(ACRES) = 12.80 SUBAREA RUNOFF(CFS) = 25.82  
 TOTAL AREA(ACRES) = 271.60 TOTAL RUNOFF(CFS) = 342.07  
 TC(MIN) = 24.35

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 31.00 TO NODE 32.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"  
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
 NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION  
 WITH 10-MINUTES ADDED = 12.62(MINUTES)  
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 900.00  
 UPSTREAM ELEVATION = 600.00  
 DOWNSTREAM ELEVATION = 400.00  
 ELEVATION DIFFERENCE = 200.00  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.625  
 SUBAREA RUNOFF(CFS) = 14.84  
 TOTAL AREA(ACRES) = 9.10 TOTAL RUNOFF(CFS) = 14.84

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 32.00 TO NODE 35.00 IS CODE = 6

>>>>COMPUTE STREETFLOW TRAVELTIME THRU SUBAREA<<<<

UPSTREAM ELEVATION = 400.00 DOWNSTREAM ELEVATION = 333.00  
 STREET LENGTH(FEET) = 1000.00 CURB HEIGHT(INCHES) = 6.  
 STREET HALFWIDTH(FEET) = 15.00 STREET CROSSFALL(DECIMAL) = .0200  
 SPECIFIED NUMBER OF HALFWESTREETS CARRYING RUNOFF = 2  
 \*\*TRAVELTIME COMPUTED USING MEAN FLOW(CFS) = 21.04  
 STREET FLOWDEPTH(FEET) = .37  
 HALFWESTREET FLOODWIDTH(FEET) = 12.05  
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.70  
 PRODUCT OF DEPTH&VELOCITY = 2.46  
 STREETFLOW TRAVELTIME(MIN) = 2.49 TC(MIN) = 15.11

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.228

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 7.00 SUBAREA RUNOFF(CFS) = 12.43  
 SUMMED AREA(ACRES) = 16.10 TOTAL RUNOFF(CFS) = 27.27  
 END OF SUBAREA STREETFLOW HYDRAULICS:  
 DEPTH(FEET) = .40 HALFSTREET FLOODWIDTH(FEET) = 13.73  
 FLOW VELOCITY(FEET/SEC.) = 6.80 DEPTH\*VELOCITY = 2.73

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 36.00 TO NODE 37.00 IS CODE = 2

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

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.24(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 500.00

UPSTREAM ELEVATION = 790.00

DOWNSTRM ELEVATION = 550.00

ELEVATION DIFFERENCE = 240.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.906

SUBAREA RUNOFF(CFS) = 8.79

TOTAL AREA(ACRES) = 5.00 TOTAL RUNOFF(CFS) = 8.79

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 37.00 TO NODE 38.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 500.00

DOWNSTRM NODE ELEVATION = 396.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00

CHANNEL BASE(FEET) = .00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 10.00

CHANNEL FLOW THRU SUBAREA(CFS) = 8.79

FLOW VELOCITY(FEET/SEC) = 7.57 FLOW DEPTH(FEET) = .76

TRAVEL TIME(MIN.) = 2.20 TC(MIN.) = 13.44

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 37.00 TO NODE 38.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.481

SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

SUBAREA AREA(ACRES) = 10.00 SUBAREA RUNOFF(CFS) = 15.66

TOTAL AREA(ACRES) = 15.00 TOTAL RUNOFF(CFS) = 24.45

TC(MIN) = 13.44

\*\*\*\*\*

**BASIN Y**

FLOW PROCESS FROM NODE 38.00 TO NODE 40.00 IS CODE = 3

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

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

ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 24.000

DEPTH OF FLOW IN 24.0 INCH PIPE IS 11.5 INCHES

PIPEFLOW VELOCITY(FEET/SEC.) = 16.4

UPSTREAM NODE ELEVATION = 396.00

DOWNTSTREAM NODE ELEVATION = 330.00

FLOW LENGTH (FEET) = 1100.00 MANNINGS N = .013

FLOWLENGTH (FEET) = 115.00 ESTIMATED PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1

ESTIMATED PIPE DIAMETER (INCH) = 24.45  
PIPEFLOW THRU SUBAREA (CFS) =

TRAVEL TIME(MIN.) = 1.12 TC(MIN.) = 14.56

\*\*\*\*\* FLOW PROCESS FROM NODE 38.00 TO NODE 40.00 IS CODE = 8

FLOW PROCESS FROM NODE 38.00 TO NODE 40.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.306

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.308

SOIL CLASSIFICATION IS "D" - THE DURNESS COEFFICIENT = 5500

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
100% PLOT SIZE IN ACRES (GFS) = 12.73

SUBAREA AREA(ACRES) = 7.00 SUBAREA RUNOFF(CFS) = 1

**TOTAL AREA (ACRES)**

-----  
END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
1985-1981 HYDROLOGY MANUAL

(C) Copyright 1982,1986 Advanced Engineering Software [AES]

Especially prepared for:

BSI CONSULTANTS

\*\*\*\*\*DESCRIPTION OF RESULTS\*\*\*\*\*  
\* CITY OF SANTEE \*  
\* 100-YEAR RUNOFF \*  
\* BASIN Z \* SEPTEMBER 1989 \*

**USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:**

1985 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.500

SPECIFIED MINIMUM PIPE SIZE(INCH) = 24.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = .90

Advanced Engineering Software [AES]  
SERIAL No. I0723I  
VER. 3.4A RELEASE DATE: 4/22/86

\*\*\*\*\* FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 2

## >>> NATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<

=====  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 12.16(MINUTES)  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 700.00  
UPSTREAM ELEVATION = 1196.00  
DOWNSTREAM ELEVATION = 1040.00  
ELEVATION DIFFERENCE = 156.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.713  
SUBAREA RUNOFF(CFS) = 10.03  
TOTAL AREA(ACRES) = 6.00 TOTAL RUNOFF(CFS) = 10.03

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 1040.00  
DOWNSTREAM NODE ELEVATION = 510.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 2800.00  
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .040 MAXIMUM DEPTH(FEET) = 5.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 10.03  
FLOW VELOCITY(FEET/SEC) = 6.13 FLOW DEPTH(FEET) = .29  
TRAVEL TIME(MIN.) = 7.62 TC(MIN.) = 19.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 5.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.713  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 106.80 SUBAREA RUNOFF(CFS) = 130.40  
TOTAL AREA(ACRES) = 112.80 TOTAL RUNOFF(CFS) = 140.42  
TC(MIN) = 19.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<

DEPTH OF FLOW IN 42.0 INCH PIPE IS 20.4 INCHES  
PIPEFLOW VELOCITY(FEET/SEC.) = 30.4  
UPSTREAM NODE ELEVATION = 510.00  
DOWNSTREAM NODE ELEVATION = 385.00  
FLOWLENGTH(FEET) = 1300.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 140.42  
TRAVEL TIME(MIN.) = .71 TC(MIN.) = 20.49

\*\*\*\*\*  
FLOW PROCESS FROM NODE 5.00 TO NODE 10.00 IS CODE = 1

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

===== CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:

TIME OF CONCENTRATION(MINUTES) = 20.49

RAINFALL INTENSITY (INCH./HOUR) = 2.65

TOTAL STREAM AREA (ACRES) = 112.80

TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 140.42

#### CONFLUENCE INFORMATION:

| STREAM NUMBER | RUNOFF (CFS) | TIME (MIN.) | INTENSITY (INCH/HOUR) |
|---------------|--------------|-------------|-----------------------|
|---------------|--------------|-------------|-----------------------|

|   |        |       |       |
|---|--------|-------|-------|
| 1 | 140.42 | 20.49 | 2.652 |
|---|--------|-------|-------|

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 1 STREAMS  
VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

140.42

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

RUNOFF(CFS) = 140.42 TIME(MINUTES) = 20.491

TOTAL AREA(ACRES) = 112.80

\*\*\*\*\*  
FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 2

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

===== SOIL CLASSIFICATION IS "D"

RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500

NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION

WITH 10-MINUTES ADDED = 11.53(MINUTES)

INITIAL SUBAREA FLOW-LENGTH(FEET) = 350.00

UPSTREAM ELEVATION = 1148.00

DOWNSTREAM ELEVATION = 1100.00

ELEVATION DIFFERENCE = 48.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.843

SUBAREA RUNOFF(CFS) = 13.84

TOTAL AREA(ACRES) = 8.00 TOTAL RUNOFF(CFS) = 13.84

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 5

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

>>>>TRAVELTIME THRU SUBAREA<<<<

===== UPSTREAM NODE ELEVATION = 1100.00

DOWNSTREAM NODE ELEVATION = 385.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 3200.00

CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000

MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 2.00

CHANNEL FLOW THRU SUBAREA(CFS) = 13.84  
 FLOW VELOCITY(FEET/SEC) = 9.42 FLOW DEPTH(FEET) = .27  
 TRAVEL TIME(MIN.) = 5.66 TC(MIN.) = 17.19

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.970  
 SOIL CLASSIFICATION IS "D"  
 RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
 SUBAREA AREA(ACRES) = 94.50 SUBAREA RUNOFF(CFS) = 126.30  
 TOTAL AREA(ACRES) = 102.50 TOTAL RUNOFF(CFS) = 140.14  
 TC(MIN) = 17.19

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 1

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

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION(MINUTES) = 17.19  
 RAINFALL INTENSITY (INCH./HOUR) = 2.97  
 TOTAL STREAM AREA (ACRES) = 102.50  
 TOTAL STREAM RUNOFF(CFS) AT CONFLUENCE = 140.14

CONFLUENCE INFORMATION:

| STREAM NUMBER | RUNOFF (CFS) | TIME (MIN.) | INTENSITY (INCH/HOUR) |
|---------------|--------------|-------------|-----------------------|
|---------------|--------------|-------------|-----------------------|

|   |        |       |       |
|---|--------|-------|-------|
| 1 | 140.42 | 20.49 | 2.652 |
| 2 | 140.14 | 17.19 | 2.970 |

RAINFALL-INTENSITY-RATIO CONFLUENCE FORMULA USED FOR 2 STREAMS  
 VARIOUS CONFLUENCED RUNOFF VALUES ARE AS FOLLOWS:

265.55 265.52

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 RUNOFF(CFS) = 265.55 TIME(MINUTES) = 20.491  
 TOTAL AREA(ACRES) = 215.30

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
 >>>>USING USER-SPECIFIED PIPESIZE<<<<

DEPTH OF FLOW IN 54.0 INCH PIPE IS 31.7 INCHES  
 PIPEFLOW VELOCITY(FEET/SEC.) = 27.4  
 UPSTREAM NODE ELEVATION = 385.00  
 DOWNSTREAM NODE ELEVATION = 320.00

FLOWLENGTH(FEET) = 1350.00 MANNINGS N = .013  
GIVEN PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 265.55  
TRAVEL TIME(MIN.) = .82 TC(MIN.) = 21.31

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 15.00 IS CODE = 8

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
\*\*\*\*\*  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.585  
SOIL CLASSIFICATION IS "D"  
MULTI-UNITS DEVELOPMENT RUNOFF COEFFICIENT = .7000  
SUBAREA AREA(ACRES) = 51.50 SUBAREA RUNOFF(CFS) = 93.21  
TOTAL AREA(ACRES) = 266.80 TOTAL RUNOFF(CFS) = 358.76  
TC(MIN) = 21.31

\*\*\*\*\*  
FLOW PROCESS FROM NODE 25.00 TO NODE 30.00 IS CODE = 2

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<  
\*\*\*\*\*  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
NATURAL WATERSHED NOMOGRAPH TIME OF CONCENTRATION  
WITH 10-MINUTES ADDED = 12.08(MINUTES)  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 660.00  
UPSTREAM ELEVATION = 925.00  
DOWNSTREAM ELEVATION = 780.00  
ELEVATION DIFFERENCE = 145.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.730  
SUBAREA RUNOFF(CFS) = 11.25  
TOTAL AREA(ACRES) = 6.70 TOTAL RUNOFF(CFS) = 11.25

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<  
\*\*\*\*\*  
UPSTREAM NODE ELEVATION = 780.00  
DOWNSTREAM NODE ELEVATION = 560.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 1000.00  
CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.000  
MANNINGS FACTOR = .030 MAXIMUM DEPTH(FEET) = 5.00  
CHANNEL FLOW THRU SUBAREA(CFS) = 11.25  
FLOW VELOCITY(FEET/SEC) = 8.04 FLOW DEPTH(FEET) = .25  
TRAVEL TIME(MIN.) = 2.07 TC(MIN.) = 14.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 30.00 TO NODE 35.00 IS CODE = 3

BASIN\_Z

-----  
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.368  
SOIL CLASSIFICATION IS "D"  
RURAL DEVELOPMENT RUNOFF COEFFICIENT = .4500  
SUBAREA AREA(ACRES) = 22.80 SUBAREA RUNOFF(CFS) = 34.55  
TOTAL AREA(ACRES) = 29.50 TOTAL RUNOFF(CFS) = 45.80  
TC(MIN) = 14.15

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<  
=====  
PIPEFLOW VELOCITY(FEET/SEC.) = 14.6  
UPSTREAM NODE ELEVATION = 560.00  
DOWNSTREAM NODE ELEVATION = 520.00  
FLOWLENGTH(FEET) = 350.00 MANNINGS N = .024  
GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 45.80  
TRAVEL TIME(MIN.) = .40 TC(MIN.) = 14.55

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 35.00 TO NODE 40.00 IS CODE = 8  
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<  
=====  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.308  
SOIL CLASSIFICATION IS "D"  
SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500  
SUBAREA AREA(ACRES) = 11.40 SUBAREA RUNOFF(CFS) = 20.74  
TOTAL AREA(ACRES) = 40.90 TOTAL RUNOFF(CFS) = 66.53  
TC(MIN) = 14.55

\*\*\*\*\*  
\*\*\*\*\* FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 4  
-----

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<  
>>>>USING USER-SPECIFIED PIPESIZE<<<<  
=====  
PIPEFLOW VELOCITY(FEET/SEC.) = 16.7  
UPSTREAM NODE ELEVATION = 520.00  
DOWNSTREAM NODE ELEVATION = 450.00  
FLOWLENGTH(FEET) = 650.00 MANNINGS N = .024  
GIVEN PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1  
PIPEFLOW THRU SUBAREA(CFS) = 66.53  
TRAVEL TIME(MIN.) = .65 TC(MIN.) = 15.20

\*\*\*\*\*  
\*\*\*\*\*

FLOW PROCESS FROM NODE 40.00 TO NODE 45.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.216

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 10.20 SUBAREA RUNOFF(CFS) = 18.04

TOTAL AREA(ACRES) = 51.10 TOTAL RUNOFF(CFS) = 84.58

TC(MIN) = 15.20

\*\*\*\*\*  
FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE<<<<

PIPEFLOW VELOCITY(FEET/SEC.) = 17.2

UPSTREAM NODE ELEVATION = 450.00

DOWNSTREAM NODE ELEVATION = 400.00

FLOWLENGTH(FEET) = 600.00 MANNINGS N = .024

GIVEN PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 84.58

TRAVEL TIME(MIN.) = .58 TC(MIN.) = 15.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 45.00 TO NODE 50.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.139

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 38.80 SUBAREA RUNOFF(CFS) = 66.99

TOTAL AREA(ACRES) = 89.90 TOTAL RUNOFF(CFS) = 151.56

TC(MIN) = 15.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 4

>>>>COMPUTE PIPEFLOW TRAVELTIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE<<<<

PIPEFLOW VELOCITY(FEET/SEC.) = 30.9

UPSTREAM NODE ELEVATION = 400.00

DOWNSTREAM NODE ELEVATION = 350.00

FLOWLENGTH(FEET) = 700.00 MANNINGS N = .024

GIVEN PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1

PIPEFLOW THRU SUBAREA(CFS) = 151.56

TRAVEL TIME(MIN.) = .38 TC(MIN.) = 16.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 50.00 TO NODE 55.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.092

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 20.20 SUBAREA RUNOFF(CFS) = 34.35

TOTAL AREA(ACRES) = 110.10 TOTAL RUNOFF(CFS) = 185.91

TC(MIN) = 16.15

\*\*\*\*\*  
FLOW PROCESS FROM NODE 60.00 TO NODE 65.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 11.86 RAIN INTENSITY(INCH/HOUR) = 3.77

TOTAL AREA(ACRES) = 1.65 TOTAL RUNOFF(CFS) = 3.42

\*\*\*\*\*  
FLOW PROCESS FROM NODE 65.00 TO NODE 70.00 IS CODE = 5

>>>>COMPUTE TRAPEZOIDAL-CHANNEL FLOW<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<

UPSTREAM NODE ELEVATION = 400.00

DOWNTSTREAM NODE ELEVATION = 342.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 1050.00

CHANNEL BASE(FEET) = 2.00 "Z" FACTOR = .000

MANNINGS FACTOR = .015 MAXIMUM DEPTH(FEET) = 2.00

CHANNEL FLOW THRU SUBAREA(CFS) = 3.42

FLOW VELOCITY(FEET/SEC) = 7.30 FLOW DEPTH(FEET) = .23

TRAVEL TIME(MIN.) = 2.40 TC(MIN.) = 14.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 65.00 TO NODE 70.00 IS CODE = 8

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

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.351

SOIL CLASSIFICATION IS "D"

SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500

SUBAREA AREA(ACRES) = 18.90 SUBAREA RUNOFF(CFS) = 34.83

TOTAL AREA(ACRES) = 20.55 TOTAL RUNOFF(CFS) = 38.25

TC(MIN) = 14.26

=====

END OF RATIONAL METHOD ANALYSIS





## **APPENDIX V**

**SUPPORTING DATA**

## USER SPECIFIED DATA

| NODE     | AREA<br>(ACREAS)        | LENGTH<br>(FT) | UPSTREAM<br>ELEVATION | DOWNSTREAM<br>ELEVATION | C    | P6<br>(IN) | TC<br>(MIN) | I<br>(IN/HR) | Q<br>(CFS) |
|----------|-------------------------|----------------|-----------------------|-------------------------|------|------------|-------------|--------------|------------|
| A 19-20  | 12.86                   | 1300           | 375                   | 330                     | 0.55 | 2.5        | 23.60       | 2.42         | 17.12      |
| B 5-10   | 9.15                    | 1000           | 400                   | 355                     | 0.55 | 2.5        | 18.96       | 2.79         | 14.03      |
| B 38-39  | 9.10                    | 750            | 385                   | 363                     | 0.55 | 2.5        | 18.94       | 2.79         | 13.96      |
| B 43-44  | 9.00                    | 1300           | 380                   | 345                     | 0.55 | 2.5        | 25.66       | 2.29         | 11.35      |
| D 1- 2   | 11.48                   | 1200           | 790                   | 550                     | 0.55 | 2.6        | 13.61       | 3.59         | 22.67      |
| D 16-17  | 2.90                    | 300            | 470                   | 440                     | 0.55 | 2.6        | 7.96        | 5.08         | 8.10       |
| D 21-22  | 6.73                    | 500            | 613                   | 535                     | 0.55 | 2.6        | 8.86        | 4.74         | 17.53      |
| D 26-27  | 7.93                    | 950            | 475                   | 435                     | 0.55 | 2.6        | 18.90       | 2.91         | 12.67      |
| D 31-32  | 4.80                    | 500            | 515                   | 445                     | 0.55 | 2.6        | 9.18        | 4.63         | 12.22      |
| D 36-37  | 4.10                    | 600            | 740                   | 650                     | 0.55 | 2.6        | 20.63       | 2.75         | 7.55       |
| E 1- 2   | 5.00                    | 800            | 435                   | 415                     | 0.55 | 2.6        | 15.10       | 3.36         | 7.39       |
| E 16-17  | 4.00                    | 550            | 405                   | 385                     | 0.55 | 2.6        | 11.22       | 4.07         | 6.71       |
| E 26-30  | 3.00                    | 400            | 477                   | 455                     | 0.55 | 2.6        | 21.35       | 2.58         | 10.92      |
| F 1- 2   | 7.70                    | 850            | 388                   | 367                     | 0.55 | 2.5        | 24.85       | 2.34         | 8.94       |
| F 6- 7   | 6.94                    | 980            | 414                   | 394                     | 0.55 | 2.5        | 3.27        | 11.18        |            |
| K 250-35 | CONFLUENCE FROM BASIN J |                |                       |                         |      |            |             |              |            |
| K 450-36 | CONFLUENCE FROM BASIN J |                |                       |                         |      |            |             |              |            |
| L 4- 5   | 6.22                    | 970            | 530                   | 469                     | 0.55 | 2.7        | 16.70       | 3.35         | 22.33      |
| L 31-35  | 12.12                   | 950            | 485                   | 420                     | 0.55 | 2.7        | 16.07       | 3.86         | 21.06      |
| M 1- 5   | 9.91                    | 750            | 501                   | 431                     | 0.55 | 2.7        | 12.88       | 4.67         | 16.68      |
| O 11-12  | 6.50                    | 970            | 1045                  | 725                     | 0.55 | 2.7        | 9.61        | 6.40         | 57.80      |
| Q 1- 2   | 9.50                    | 900            | 418                   | 390                     | 0.95 | 2.6        | 5.55        | 2.46         | 19.63      |
| Q 21-22  | 11.42                   | 1000           | 366                   | 358                     | 0.7  | 2.6        | 24.53       | 3.48         |            |
| Q 26-27  | 5.72                    | 800            | 376                   | 355                     | 0.95 | 2.6        | 5.53        | 6.42         | 34.88      |
| Q 31-32  | 9.80                    | 800            | 354                   | 351                     | 0.55 | 2.6        | 38.83       | 1.83         | 9.84       |
| R 11-12  | 3.00                    | 300            | 356                   | 355                     | 0.55 | 2.6        | 24.80       | 2.44         | 4.02       |
| S 1- 5   | 8.96                    | 1100           | 347                   | 342                     | 0.85 | 2.6        | 19.41       | 2.86         | 21.76      |
| S 21-25  | 8.04                    | 1000           | 345                   | 336                     | 0.85 | 2.6        | 14.74       | 3.41         | 23.31      |
| S 36-40  | 4.09                    | 750            | 331                   | 325                     | 0.55 | 2.6        | 29.21       | 2.19         | 4.94       |
| U 1 -2   | 4.69                    | 700            | 530                   | 425                     | 0.55 | 2.5        | 10.62       | 4.05         | 10.45      |
| V 1 -2   | 8.00                    | 700            | 770                   | 700                     | 0.55 | 2.5        | 12.16       | 3.71         | 16.34      |
| W 50-55  | 4.11                    | 700            | 380                   | 353                     | 0.55 | 2.5        | 16.70       | 3.03         | 6.84       |
| W 61-62  | 4.33                    | 830            | 357                   | 328                     | 0.55 | 2.5        | 18.80       | 2.80         | 6.68       |
| Z 60-65  | 1.65                    | 500            | 432                   | 400                     | 0.55 | 2.5        | 11.86       | 3.77         | 3.42       |

## EXAMPLE CALCULATION

NODE A 19-20

|        |                       |                                    |
|--------|-----------------------|------------------------------------|
| GIVEN: | AREA=                 | 12.86 (FROM TOPO)                  |
|        | LENGTH=               | 1300 (FROM TOPO)                   |
|        | UPSTREAM ELEVATION=   | 375 (FROM TOPO)                    |
|        | DOWNSTREAM ELEVATION= | 330 (FROM TOPO)                    |
|        | C=                    | 0.55 (SINGLE FAMILY)               |
|        | P6=                   | 2.5 (FROM COUNTY HYDROLOGY MANUAL) |

$$TC = \frac{1.8(1.1 - C)\sqrt{LENGTH}}{\sqrt[3]{SLOPE (\%)}}$$

$$\text{SLOPE} = \frac{375 - 330}{1300} * 100\%$$

$$= 3.46 \%$$

$$TC = \frac{1.8(1.1 - .55)\sqrt{1300}}{\sqrt[3]{3.46}}$$

$$= 23.60 \text{ MINUTES}$$

$$I = 7.44 * P6 * TC$$

$$= (7.44)(2.5)(22.9)$$

$$= 2.42 \text{ IN/HR}$$

$$Q = CIA$$

$$= (.55)(2.42)(12.86)$$

$$= 17.12 \text{ CFS}$$



## CITY OF SANTEE --- SUMMARY OF RECOMMENDED IMPROVEMENTS

| LINE     | SIZE                 | SLOPE      | LENGTH<br>(FT) | N VALUE | CAPACITY<br>(CFS) | 100-YEAR<br>FLOW<br>(CFS) | DEFICIENCY<br>RATING | RECOMMENDATIONS      | UNIT<br>COST | COST         |
|----------|----------------------|------------|----------------|---------|-------------------|---------------------------|----------------------|----------------------|--------------|--------------|
|          |                      |            |                |         |                   |                           |                      | REPLACEMENT<br>PIPE  | PIPE         | (\$)<br>/LF) |
| * +C5c   | 18 " CMP             | 0.025      | [ 100 ]        | 0.024   | 9                 | 24                        | C,S                  | 24                   |              | 130          |
| * +D5a   | 18 " RCP             | 0.04       | [ 450 ]        | 0.013   | 21                | 96                        | C                    | 36                   |              | 175          |
| * +D65g  | [b=5' h=3' s=3:1]    | [ 0.0096 ] | [ 6000 ]       | 0.03    | 296               | 610                       | C,?                  | b=10' h=5' s=1.5:1   |              | 150          |
| * +E5g   | (2) 72 " CMP         | 0.002      | [ 730 ]        | 0.024   | 205               | 610                       | C,S                  | 12X6 RCB             |              | 1085         |
| * +E30c1 | 36 " CMP             | 0.02       | 86             | 0.024   | 51                | 77                        | C,S                  | 36                   |              | 175          |
| * +E30c2 | 36 " CMP             | 0.016      | 18             | 0.024   | 46                | 84                        | C,S                  | 36                   |              | 175          |
| * +G25a  | (3) 48 " CMP         | 0.017      | 132            | 0.024   | 304               | 561                       | C,M,S                | 8X4 RCB              |              | 435          |
| * +H5a3  | 30 " CMP             | 0.02       | 37             | 0.024   | 31                | 67                        | C,S                  | 36                   |              | 175          |
| * +H5a4  | 30 " CMP             | 0.04       | 44             | 0.024   | 44                | 67                        | C,S                  | 36                   |              | 175          |
| * +H5a5  | 30 " CMP             | 0.06       | 26             | 0.024   | 54                | 67                        | C,S                  | 36                   |              | 175          |
| * +H5d1  | 42 " RCP             | 0.005      | 110            | 0.013   | 71                | 155                       | C                    | 5X4 RCB              |              | 315          |
| * +H5d2  | 58 " X 36 " CMPA     | 0.005      | [ 50 ]         | 0.024   | 47                | 173                       | C,S                  | 5X4 RCB              |              | 315          |
| * +H5d3  | 65 " X 40 " CMPA     | 0.006      | 85             | 0.024   | 68                | 173                       | C,S                  | 5X4 RCB              |              | 26744        |
| * +J20a  | 54 " RCP             | 0.0071     | 345            | 0.013   | 166               | 235                       | C                    |                      | 42           | 200          |
| * +J25e  | 54 " RCP             | 0.0161     | [ 900 ]        | 0.013   | 249               | 312                       | C                    |                      | 36           | 175          |
| * +J30d  | [b=20' h=2.5' s=5:1] | 0.007      | [ 2000 ]       | 0.03    | 496               | 1800                      | C,E,M                | b=20 h=6 s=1.5 n=.03 | 220          | 440000       |
| * +R5i   | 84 " CMP             | 0.015      | 67             | 0.024   | 424               | 780                       | C,S                  | 84                   |              | 390          |
| * +K15h  | 36 " RCP             | 0.005      | [ 1100 ]       | 0.013   | 47                | 60                        | C                    |                      | 24           | 130          |
| * +L5c   | 27 " RCP             | 0.014      | 60             | 0.013   | 37                | 92                        | C                    | 42                   |              | 200          |
| * +L10h  | 36 " RCP             | 0.024      | 800            | 0.013   | 103               | 137                       | C                    | 42                   |              | 200          |
| * +L10j  | 42 " RCP             | 0.01       | 500            | 0.013   | 101               | 228                       | C                    |                      | 48           | 230          |
| * +L15a1 | (2) 36" X 22" CMPA   | 0.01       | 50             | 0.024   | 36                | 168                       | C,S                  | 6X3 RCB              |              | 335          |
| * +L15c  | 42 " RCP             | 0.0142     | 502            | 0.013   | 120               | 215                       | C                    |                      | 42           | 200          |
| * +L15e  | 48 " RCP             | 0.0118     | 350            | 0.013   | 156               | 241                       | C                    |                      | 42           | 200          |
| * +L15f  | 64 " X 53 " CMPA     | 0.0163     | 131            | 0.024   | 146               | 247                       | C,S                  | 54                   |              | 260          |
| * +L15g  | (2) 49" X 33" CMPA   | 0.009      | 121            | 0.024   | 84                | 247                       | C,S                  | 60                   |              | 285          |
| * +L20b1 | 54 " CIP             | 0.007      | 300            | 0.013   | 164               | 265                       | C                    |                      | 48           | 230          |
| * +L20b2 | 54 " RCP             | 0.003      | 350            | 0.013   | 108               | 265                       | C                    |                      | 48           | 230          |
| * +L20b3 | 54 " CIP             | 0.007      | 243            | 0.013   | 164               | 265                       | C                    |                      | 48           | 230          |
| * +L30h  | 42 " CIP             | 0.004      | 1005           | 0.013   | 64                | 102                       | C                    |                      | 36           | 175          |
| * +M15d  | b=0 h=1.4 s=1:1      | 0.005      | [ 550 ]        | 0.015   | 9                 | 51                        | C                    | 36                   |              | 175          |
| * +M20a1 | 24 " RCP             | 0.0343     | 344            | 0.013   | 42                | 85                        | C                    | 33                   |              | 160          |
| * +M20a2 | 24 " RCP             | 0.0414     | 271            | 0.013   | 46                | 99                        | C                    | 33                   |              | 160          |
| * +M25b  | 30 " RCP             | 0.006      | [ 750 ]        | 0.013   | 32                | 42                        | C                    |                      | 24           | 130          |
| * +M25c1 | 30 " RCP             | 0.0057     | 175            | 0.013   | 31                | 58                        | C                    |                      | 30           | 150          |
| * +M25d  | 30 " RCP             | 0.005      | 486            | 0.013   | 29                | 58                        | C                    |                      | 42           | 200          |
| * +M30c  | 60 " RCP             | 0.003      | [ 2000 ]       | 0.013   | 143               | 250                       | C                    |                      | 54           | 260          |
| * +O10b1 | 24 " CMP             | 0.025      | 313            | 0.024   | 19                | 163                       | C,S                  | 42                   |              | 200          |
| * +O10b2 | 24 " CMP             | 0.03       | 400            | 0.024   | 21                | 163                       | C,S                  | 42                   |              | 200          |
| * +O10b3 | 24 " CMP             | 0.04       | 268            | 0.024   | 24                | 163                       | C,S                  | 42                   |              | 200          |
| * +O10d  | 27 " RCP             | 0.0804     | 709            | 0.013   | 88                | 190                       | C                    | 42                   |              | 14172        |
| * +O10e  | 36 " RCP             | 0.008      | 218            | 0.013   | 60                | 210                       | C                    |                      | 48           | 230          |
| * +O10g  | 65 " X 40 " CMPA     | 0.002      | 362            | 0.024   | 39                | 230                       | C,S                  | (2)7X4 RCB           |              | 975          |
| * +O10h  | 72 " X 44 " CMPA     | 0.002      | 322            | 0.024   | 51                | 260                       | C,S                  | (2)7X4 RCB           |              | 975          |
| * +O15d  | 30 " RCP             | 0.009      | 168            | 0.013   | 39                | 114                       | C                    |                      | 33           | 160          |
| * +O15e  | 33 " RCP             | 0.009      | 420            | 0.013   | 50                | 137                       | C                    | 6X3 RCB              |              | 335          |
| * +O15f  | (2) 27 " RCP         | 0.008      | 154            | 0.013   | 55                | 166                       | C                    | 6X3 RCB              |              | 335          |
| * +O25k  | 24 " RCP             | 0.005      | 212            | 0.013   | 16                | 64                        | C                    | 42                   |              | 200          |
| * +O25l  | 30 " RCP             | 0.005      | 47             | 0.013   | 29                | 81                        | C                    |                      | 36           | 175          |

\* = MASTER DRAINAGE FACILITY + = DEFICIENT MASTER DRAINAGE FACILITY [ ] = ESTIMATED VALUE

DEFICIENCIES: C = CAPACITY E = EROSION M = MAINTENANCE S = SERVICE LIFE V = VELOCITY ? = NOT ENOUGH DATA

## CITY OF SANTEE --- SUMMARY OF RECOMMENDED IMPROVEMENTS

| LINE     | SIZE                           | SLOPE  | LENGTH<br>(FT) | N VALUE | CAPACITY<br>(CFS) | 100-YEAR<br>FLOW<br>(CFS) | DEFICIENCY<br>RATING | RECOMMENDATIONS<br>REPLACEMENT PIPE | UNIT<br>PIPE | COST   |
|----------|--------------------------------|--------|----------------|---------|-------------------|---------------------------|----------------------|-------------------------------------|--------------|--------|
| * +P10e3 | 42 " RCP                       | 0.0261 | 308            | 0.013   | 162               | 187                       | C                    |                                     | 24 130       | 39975  |
| * +P10e4 | 42 " RCP                       | 0.0182 | 301            | 0.013   | 136               | 187                       | C                    |                                     | 30 150       | 45075  |
| * +P10e5 | 42 " RCP                       | 0.0145 | 189            | 0.013   | 121               | 187                       | C                    |                                     | 36 175       | 33075  |
| * +P15c  | 48 " RCP                       | 0.0135 | 212            | 0.013   | 167               | 282                       | C                    |                                     | 42 200       | 42400  |
| * +P15e  | 24 " RCP                       | 0.0076 | [ 1100 ]       | 0.013   | 20                | 118                       | C                    | 48                                  | 230          | 253000 |
| * +P15f  | 54 " RCP                       | 0.0132 | 606            | 0.013   | 226               | 420                       | C                    |                                     | 54 260       | 157560 |
| * +P15g  | (2) 57" X 38" CMPA             | 0.01   | [ 610 ]        | 0.024   | 132               | 476                       | C,S                  | (2) 60                              | 515 315      | 314150 |
| * +P20a  | 4 ' X 8 ' RCB                  | 0.0031 | 456            | 0.013   | 247               | 476                       | C                    |                                     | 72 315       | 143640 |
| * +P20b  | 84 " CSP                       | 0.001  | 562            | 0.013   | 202               | 507                       | C,S                  |                                     | 72 315       | 177030 |
| * +P20c  | 78 " CIP                       | 0.001  | 66             | 0.013   | 166               | 515                       | C                    |                                     | 72 315       | 20866  |
| * +P20d  | (2) 4' X 5 ' RCB               | 0.001  | 145            | 0.013   | 210               | 520                       | C                    |                                     | 72 315       | 45675  |
| * +Q5b   | 33 " RCP                       | 0.008  | 362            | 0.013   | 47                | 176                       | C                    |                                     | 42 200       | 72400  |
| * +Q5c   | 33 " RCP                       | 0.01   | 380            | 0.013   | 53                | 230                       | C                    | 8X4 RCB                             | 435          | 165300 |
| * +Q5d   | 36 " ACP                       | 0.008  | 347            | 0.013   | 60                | 300                       | C                    | 8X4 RCB                             | 435          | 150723 |
| * +Q10a  | 42 " RCP                       | 0.0039 | 329            | 0.013   | 63                | 325                       | C                    | 10X4 RCB                            | 585          | 192512 |
| * +Q10b  | 48 " RCP                       | 0.004  | 375            | 0.013   | 91                | 340                       | C                    | 10X4 RCB                            | 585          | 219246 |
| * +Q10c  | 48 " RCP                       | 0.0060 | 649            | 0.013   | 111               | 365                       | C                    | 10X4 RCB                            | 585          | 379782 |
| * +Q15a  | 48 " RCP                       | 0.0075 | 302            | 0.013   | 124               | 425                       | C                    | 10X4 RCB                            | 585          | 176933 |
| * +Q15b  | (2) 39 " RCP                   | 0.0046 | 842            | 0.013   | 113               | 475                       | C                    | 10X4 RCB                            | 585          | 492276 |
| * +Q20a  | (2) 42 " RCP                   | 0.002  | 383            | 0.013   | 90                | 502                       | C                    | 10X4 RCB                            | 585          | 223997 |
| * +Q25b  | 18 " RCP                       | 0.0023 | 267            | 0.013   | 5                 | 36                        | C                    | 36                                  | 175          | 46811  |
| * +Q25c  | 21 " ACP                       | 0.005  | 825            | 0.013   | 11                | 40                        | C                    | 36                                  | 175          | 144445 |
| * +Q25d  | 21 " ACP                       | 0.0066 | 69             | 0.013   | 13                | 45                        | C                    | 36                                  | 175          | 12024  |
| * +Q25e  | 33 " RCP                       | 0.004  | 674            | 0.013   | 33                | 65                        | C                    | 42                                  | 200          | 134800 |
| * +Q25f  | 33 " RCP                       | 0.005  | 20             | 0.013   | 37                | 75                        | C                    | 42                                  | 200          | 4000   |
| * +Q25g  | [b=3.5' h=2.5' s=1:1][ 0.003 ] |        | [ 650 ]        | 0.03    | 51                | 581                       | C,?                  | b=10 h=5 s=1.5:1 n=.03              | 150          | 97500  |
| * +Q25i  | 42 " RCP                       | 0.003  | 180            | 0.013   | 55                |                           | C,?                  | 8X5 RCB                             | 470          | 84506  |
| * +Q25j  | 49" X 33" CMPA                 | 0.003  | 86             | 0.024   | 24                |                           | C,S,?                | 10X5 RCB                            | 640          | 55040  |
| * +Q25k  | 42 " RCP                       | 0.003  | 325            | 0.013   | 55                |                           | C,?                  | 10X5 RCB                            | 640          | 208000 |
| * +Q25l  | [b=3' h=7 s=1.5:1] [ 0.003 ]   |        | 1570           | 0.03    | 573               |                           | C,?                  | b=10 h=6 s=1.5 n=.03                | 165          | 259050 |
| * +Q25p  | 18 " CMP                       | 0.0256 | 116            | 0.024   | 9                 |                           | S                    | 8X5 RCB                             | 470          | 54520  |
| * +Q26a  | 18 " RCP                       | 0.001  | 208            | 0.013   | 3                 | 20                        | C                    | 36                                  | 175          | 36400  |
| * +Q30a  | 18 " RCP                       | 0.0014 | [ 300 ]        | 0.013   | 4                 | 70                        | C                    | (2) 54 EXTEND TO                    | 490          | 147000 |
| * +Q30b1 | 28 " X 20 " CMPA               | 0.007  | 48             | 0.024   | 9                 | 131                       | C,S                  | (2) 54 BUENA VISTA                  | 490          | 23520  |
| * +Q30b2 | 28 " X 20 " CMPA               | 0.006  | 42             | 0.024   | 8                 | 51                        | C,S                  | 36                                  | 175          | 7350   |
| * +Q30c  | 24 " CMP                       | 0.006  | 462            | 0.024   | 9                 | 131                       | C,S                  | 8X5 RCB                             | 470          | 217140 |
| * +R10b  | 24 " RCP                       | 0.0017 | 253            | 0.013   | 9                 | 61                        | C                    | 36                                  | 175          | 44275  |
| * +S15b  | 35 " X 24 " CMPA               | 0.0036 | 178            | 0.024   | 11                | 28                        | C,S                  | (2) 24                              | 220          | 39160  |
| * +S15c  | 30 " RCP                       | 0.005  | 277            | 0.013   | 29                | 70                        | C                    |                                     | 36 175       | 48416  |
| * +S15d  | 36 " RCP                       | 0.005  | 159            | 0.013   | 47                | 95                        | C                    |                                     | 36 175       | 27790  |
| * +S15e  | 48 " RCP                       | 0.0026 | 847            | 0.013   | 73                | 110                       | C                    |                                     | 42 200       | 169428 |
| * +T5c   | 30 " RCP                       | 0.01   | 253            | 0.013   | 41                | 62                        | C                    |                                     | 24 130       | 32937  |
| * +U5a1  | 43 " X 27 " CMPA               | 0.013  | 72             | 0.024   | 35                | 64                        | C,S                  | 36                                  | 175          | 12531  |
| * +U5a2  | 43 " X 27 " CMPA               | 0.016  | 49             | 0.024   | 38                | 64                        | C,S                  | 36                                  | 175          | 8510   |
| * +U20a  | 28 " X 20 " CMPA               | 0.0051 | 1166           | 0.024   | 7                 | 58                        | C,S                  | 42                                  | 200          | 233201 |
| * +U20b  | 30 " CMP                       | 0.0037 | 394            | 0.024   | 14                | 68                        | C,S                  | 42                                  | 200          | 78800  |
| * +V30a2 | [b=16' h=3' s=1:1] [ 0.019 ]   |        | [ 200 ]        | 0.03    | 684               | 1175                      | C,?                  | b=12 h=5.5 s=1.5 n=.03              | 155          | 31000  |
| * +V45d  | b=5' h=5' s=1.5:1              | 0.0181 | [ 800 ]        | 0.03    | 810               | 1387                      | C,E,M                | b=8 h=5 s=1.5 n=.015                | 230          | 194000 |
| * +V45k  | [b=7 h=5 s=1.5:1]              | 0.006  | 400            | 0.03    | 565               | 1472                      | C,?                  | b=12 h=6 s=1.5 n=.015               | 380          | 15200  |

\* = MASTER DRAINAGE FACILITY  
DEFICIENCIES: C = CAPACITY E = EROSION

+ = DEFICIENT MASTER DRAINAGE FACILITY  
E = MAINTENANCE S = SERVICE LIFE V = VELOCITY  
[ ] = ESTIMATED VALUE ? = NOT ENOUGH DATA

## CITY OF SANTEE --- SUMMARY OF RECOMMENDED IMPROVEMENTS

| LINE     | SIZE                | SLOPE     | LENGTH<br>(FT) | N VALUE | CAPACITY<br>(CFS) | 100-YEAR<br>FLOW<br>(CFS) | DEFICIENCY<br>RATING | RECOMMENDATIONS     | UNIT<br>PIPE | COST<br>PIPE |
|----------|---------------------|-----------|----------------|---------|-------------------|---------------------------|----------------------|---------------------|--------------|--------------|
| * +Y15a  | 36 " RCP            | 0.0138    | 232            | 0.013   | 78                | 289                       | C                    |                     | 48           | 230          |
| * +Y15g1 | 28 " x 20 " CMPA    | 0.0245    | 72             | 0.024   | 16                | 27                        | C,S                  | 24                  | 130          | 9360         |
| * +Z25h  | 18 " CMP            | [ 0.039 ] | [ 40 ]         | 0.024   | 11                | 359                       | C,S,?                | 6X3 RCB             | 335          | 13400        |
| * +Z25i  | [b=6' h=2.5' s=1:1] | [ 0.039 ] | [ 400 ]        | 0.03    | 264               | 359                       | C,?                  | b=6 h=4 s=1.5 n=.03 | 85           | 34000        |
| * +Z25j  | 48 " RCP            | 0.0178    | [ 50 ]         | 0.013   | 192               | 359                       | C                    |                     | 48           | 230          |
| * +Z26b  | 36 " CMP            | 0.0678    | [ 500 ]        | 0.024   | 94                | 170                       | C,S                  | 36                  | 175          | 87500        |
| * +Z26d  | 24 " CMP            | 0.03      | [ 700 ]        | 0.024   | 21                | 140                       | C,S                  | 42                  | 200          | 140000       |

TOTAL \$ 10385877

\* = MASTER DRAINAGE FACILITY    + = DEFICIENT MASTER DRAINAGE FACILITY    [ ] = ESTIMATED VALUE  
 DEFICIENCIES: C = CAPACITY    E = EROSION    M = MAINTENANCE    S = SERVICE LIFE    V = VELOCITY    ? = NOT ENOUGH DATA

### **DETERMINATION OF MINOR DEFICIENCIES**

From existing data, the Friction Slope ( $S_f$ ) was calculated for each deficient facility and multiplied by the length of the facility to calculate the elevation of the pressure head needed to propel the 100 year flow through the facility ( $H_1$ ). This was compared to the natural change in elevation of the facility plus two feet ( $H_2$ ). The difference between these two elevations is the pressure head that is in excess of what is needed to push through the 100 year flow. A negative value for  $H_2-H_1$  indicates that more than 2 foot 2 feet of pressure head is needed to maintain the flow in the facility.

## DETERMINATION OF MINOR DEFICIENCIES

| LINE  | SIZE               | SLOPE  | LENGTH<br>(FT) | N     | VALUE<br>(CFS) | CAPACITY<br>(CFS) | 100-YEAR DEFICIENCY<br>FLOW<br>(CFS) | Sf    | H1<br>SF*L | H2<br>So*L+2 | H2-H1   |
|-------|--------------------|--------|----------------|-------|----------------|-------------------|--------------------------------------|-------|------------|--------------|---------|
| C5c   | 18 " CMP           | 0.025  | 100            | 0.024 | 9              | 24                | 15                                   | 0.177 | 17.70      | 4.50         | -13.20  |
| D5a   | 18 " RCP           | 0.04   | 450            | 0.013 | 21             | 93                | 72                                   | 0.780 | 350.85     | 20.00        | -330.85 |
| D65h  | (3) 58" X 36" CMPA | 0.0096 | 50             | 0.024 | 194            | 297               | 103                                  | 0.022 | 1.12       | 2.48         | 1.36 M  |
| B5a1  | 24 " RCP           | 0.016  | 42             | 0.013 | 29             | 30                | 1                                    | 0.017 | 0.73       | 2.67         | 1.94 M  |
| E5d   | 30 " RCP           | 0.02   | 569            | 0.013 | 58             | 60                | 2                                    | 0.021 | 12.11      | 13.38        | 1.27 M  |
| E5g   | (2) 72 " CMP       | 0.002  | 730            | 0.024 | 205            | 610               | 405                                  | 0.018 | 12.84      | 3.46         | -9.38   |
| E30c1 | 36 " CMP           | 0.02   | 86             | 0.024 | 51             | 77                | 26                                   | 0.045 | 3.89       | 3.72         | -0.17   |
| E30c2 | 36 " CMP           | 0.016  | 18             | 0.024 | 46             | 84                | 38                                   | 0.054 | 0.97       | 2.29         | 1.32    |
| E30e  | 48 " RCP           | 0.0055 | 600            | 0.013 | 106            | 124               | 18                                   | 0.007 | 4.45       | 5.30         | 0.85 M  |
| F15e  | 36 " CMP           | 0.015  | 102            | 0.024 | 44             | 49                | 5                                    | 0.018 | 1.87       | 3.53         | 1.66 M  |
| G20c1 | 42 " CMP           | 0.014  | 116            | 0.024 | 64             | 90                | 26                                   | 0.027 | 3.15       | 3.62         | 0.48 M  |
| G25a  | (3) 48 " CMP       | 0.017  | 132            | 0.024 | 304            | 561               | 257                                  | 0.057 | 7.58       | 4.24         | -3.34   |
| H5a3  | 30 " CMP           | 0.02   | 37             | 0.024 | 31             | 67                | 36                                   | 0.090 | 3.33       | 2.74         | -0.60   |
| H5a4  | 30 " CMP           | 0.04   | 44             | 0.024 | 44             | 67                | 23                                   | 0.090 | 3.98       | 3.76         | -0.22   |
| H5a5  | 30 " CMP           | 0.06   | 26             | 0.024 | 54             | 67                | 13                                   | 0.090 | 2.35       | 3.56         | 1.21    |
| H5c2  | 42 " RCP           | 0.018  | 160            | 0.013 | 135            | 155               | 20                                   | 0.024 | 3.78       | 4.88         | 1.10 M  |
| H5d1  | 42 " RCP           | 0.005  | 110            | 0.013 | 71             | 155               | 84                                   | 0.024 | 2.60       | 2.55         | -0.05   |
| H5d2  | 58 " X 36 " CMPA   | 0.005  | 50             | 0.024 | 47             | 173               | 126                                  | 0.069 | 3.43       | 2.25         | -1.18   |
| H5d3  | 65 " X 40 " CMPA   | 0.006  | 85             | 0.024 | 68             | 173               | 105                                  | 0.038 | 3.26       | 2.51         | -0.75   |
| J20a  | 54 " RCP           | 0.0071 | 345            | 0.013 | 166            | 235               | 69                                   | 0.014 | 4.90       | 4.45         | -0.45   |
| J25d  | 54 " RCP           | 0.0092 | 117            | 0.013 | 189            | 312               | 123                                  | 0.025 | 2.94       | 3.08         | 0.14 M  |
| J25e  | 54 " RCP           | 0.0161 | 900            | 0.013 | 249            | 312               | 63                                   | 0.025 | 22.53      | 16.49        | -6.04   |
| J30a  | (2) 12.5'X4.5' RCB | 0.001  | 76             | 0.013 | 569            | 1720              | 1151                                 | 0.009 | 0.68       | 2.08         | 1.39 M  |
| J30d  | b=16' h=6' s=1.5:1 | 0.0052 | 2000           | 0.03  | 1347           | 1800              | 453                                  |       |            |              |         |
| K5i   | 84 " CMP           | 0.015  | 67             | 0.024 | 424            | 780               | 356                                  | 0.051 | 3.39       | 3.01         | -0.38   |
| K10f2 | 28" X 20" CMPA     | 0.008  | 138            | 0.024 | 9              | 15                | 6                                    | 0.021 | 2.86       | 3.10         | 0.24 M  |
| K15h  | 36 " RCP           | 0.005  | 1100           | 0.013 | 47             | 60                | 13                                   | 0.008 | 8.85       | 7.50         | -1.35   |
| K20f  | 24 " ACP           | 0.0343 | 327            | 0.013 | 42             | 45                | 3                                    | 0.039 | 12.86      | 13.21        | 0.35 M  |
| L5c   | 27 " RCP           | 0.014  | 60             | 0.013 | 37             | 92                | 55                                   | 0.088 | 5.27       | 2.84         | -2.43   |
| L10d  | 30 " ACP           | 0.012  | 200            | 0.013 | 45             | 47                | 2                                    | 0.013 | 2.61       | 4.40         | 1.79 M  |
| L10f3 | 30 " RCP           | 0.01   | 16             | 0.013 | 41             | 47                | 6                                    | 0.013 | 0.21       | 2.16         | 1.95 M  |
| L10h  | 36 " RCP           | 0.024  | 800            | 0.013 | 103            | 137               | 34                                   | 0.042 | 33.57      | 21.20        | -12.37  |
| L10j  | 42 " RCP           | 0.01   | 500            | 0.013 | 101            | 228               | 127                                  | 0.051 | 25.54      | 7.00         | -18.54  |
| L15a1 | (2) 36" X 22" CMPA | 0.01   | 50             | 0.024 | 36             | 168               | 132                                  | 0.217 | 10.83      | 2.50         | -8.33   |
| L15a2 | 18 " CMP           | 0.01   | 50             | 0.024 | 6              | 28                | 22                                   | 0.241 | 12.04      | 2.50         | -9.54   |
| L15c  | 42 " RCP           | 0.0142 | 502            | 0.013 | 120            | 215               | 95                                   | 0.045 | 22.80      | 9.13         | -13.67  |
| L15e  | 48 " RCP           | 0.0118 | 350            | 0.013 | 156            | 241               | 85                                   | 0.028 | 9.80       | 6.13         | -3.67   |
| L15f  | 64 " X 53 " CMPA   | 0.0163 | 131            | 0.024 | 146            | 247               | 101                                  | 0.047 | 6.08       | 4.13         | -1.95   |
| L15g  | (2) 49" X 33" CMPA | 0.009  | 121            | 0.024 | 84             | 247               | 163                                  | 0.078 | 9.41       | 3.09         | -6.32   |
| L20b1 | 54 " CIP           | 0.007  | 300            | 0.013 | 164            | 255               | 91                                   | 0.017 | 5.02       | 4.10         | -0.92   |
| L20b2 | 54 " CIP           | 0.003  | 350            | 0.013 | 108            | 255               | 147                                  | 0.017 | 5.85       | 3.05         | -2.80   |
| L20b3 | 54 " CIP           | 0.007  | 243            | 0.013 | 164            | 255               | 91                                   | 0.017 | 4.06       | 3.70         | -0.36   |
| L30f  | 42 " RCP           | 0.004  | 989            | 0.013 | 64             | 76                | 12                                   | 0.006 | 5.61       | 5.95         | 0.34 M  |
| L30h  | 42 " CIP           | 0.004  | 1005           | 0.013 | 64             | 102               | 38                                   | 0.010 | 10.27      | 6.02         | -4.25   |
| M15c  | 24 " RCP           | 0.005  | 254            | 0.013 | 16             | 21                | 5                                    | 0.009 | 2.18       | 3.27         | 1.09 M  |
| M15d  | b=0 h=1.4 s=1:1    | 0.005  | 550            | 0.015 | 9              | 51                | 42                                   |       |            |              |         |
| M15f  | 30 " RCP           | 0.0158 | 198            | 0.013 | 52             | 59                | 7                                    | 0.021 | 4.07       | 5.13         | 1.05 M  |
| M20a1 | 24 " RCP           | 0.0343 | 344            | 0.013 | 42             | 85                | 43                                   | 0.140 | 48.31      | 13.80        | -34.51  |
| M20a2 | 24 " RCP           | 0.0414 | 271            | 0.013 | 46             | 99                | 53                                   | 0.190 | 51.62      | 13.22        | -38.40  |

M = DETERMINED AS MINOR DEFICIENCY

## DETERMINATION OF MINOR DEFICIENCIES

| LINE  | SIZE               | SLOPE  | LENGTH<br>(FT) | N VALUE | CAPACITY<br>(CFS) | 100-YEAR DEFICIENCY<br>FLOW<br>(CFS) | Sf  | H1<br>SF*L | H2<br>So*L+2 | H2-H1 |          |
|-------|--------------------|--------|----------------|---------|-------------------|--------------------------------------|-----|------------|--------------|-------|----------|
| M25b  | 30 " RCP           | 0.006  | 750            | 0.013   | 32                | 42                                   | 10  | 0.010      | 7.82         | 6.50  | -1.32    |
| M25c1 | 30 " RCP           | 0.0057 | 175            | 0.013   | 31                | 58                                   | 27  | 0.020      | 3.48         | 3.00  | -0.48    |
| M25d  | 30 " RCP           | 0.005  | 486            | 0.013   | 29                | 58                                   | 29  | 0.020      | 9.67         | 4.43  | -5.24    |
| M25e  | 36 " RCP           | 0.005  | 300            | 0.013   | 47                | 58                                   | 11  | 0.008      | 2.26         | 3.50  | 1.24 M   |
| M30c  | 60 " RCP           | 0.003  | 2000           | 0.013   | 143               | 250                                  | 107 | 0.009      | 18.33        | 8.00  | -10.33   |
| O10b1 | 24 " CMP           | 0.025  | 313            | 0.024   | 19                | 163                                  | 144 | 1.760      | 550.89       | 9.83  | -541.06  |
| O10b2 | 24 " CMP           | 0.03   | 400            | 0.024   | 21                | 163                                  | 142 | 1.760      | 704.01       | 14.00 | -690.01  |
| O10b3 | 24 " CMP           | 0.04   | 268            | 0.024   | 24                | 163                                  | 139 | 1.760      | 471.69       | 12.72 | -458.97  |
| O10d  | 27 " RCP           | 0.0804 | 709            | 0.013   | 88                | 190                                  | 102 | 0.374      | 265.28       | 58.97 | -206.31  |
| O10e  | 36 " RCP           | 0.008  | 218            | 0.013   | 60                | 210                                  | 150 | 0.099      | 21.51        | 3.75  | -17.76   |
| O10f  | 54 " RCP           | 0.002  | 160            | 0.013   | 88                | 230                                  | 142 | 0.014      | 2.18         | 2.32  | 0.14 M   |
| O10g  | 65 " X 40 " CMPA   | 0.002  | 362            | 0.024   | 39                | 230                                  | 191 | 0.068      | 24.57        | 2.72  | -21.85   |
| O10h  | 72 " X 44 " CMPA   | 0.002  | 322            | 0.024   | 51                | 260                                  | 209 | 0.052      | 16.60        | 2.64  | -13.96   |
| O15d  | 30 " RCP           | 0.009  | 168            | 0.013   | 39                | 114                                  | 75  | 0.077      | 12.92        | 3.51  | -9.41    |
| O15e  | 33 " RCP           | 0.009  | 420            | 0.013   | 50                | 137                                  | 87  | 0.067      | 28.02        | 5.78  | -22.24   |
| O15f  | (2) 27 " RCP       | 0.008  | 154            | 0.013   | 55                | 166                                  | 111 | 0.071      | 10.99        | 3.23  | -7.76    |
| O15g  | 6" X 1.5" RCB      | 0.007  | 143            | 0.013   | 61                | 166                                  | 105 | 0.006      | 0.93         | 3.00  | 2.08 M   |
| O15h  | 42 " RCP           | 0.004  | 160            | 0.013   | 64                | 166                                  | 102 | 0.027      | 4.33         | 2.64  | -1.69    |
| O15i  | 72 " X 44 " CMPA   | 0.0020 | 594            | 0.024   | 52                | 166                                  | 114 | 0.021      | 12.48        | 3.24  | -9.24    |
| O25k  | 24 " RCP           | 0.005  | 212            | 0.013   | 16                | 64                                   | 48  | 0.080      | 16.88        | 3.06  | -13.82   |
| O25l  | 30 " RCP           | 0.005  | 47             | 0.013   | 29                | 81                                   | 52  | 0.039      | 1.82         | 2.24  | 0.41     |
| O30a  | 30 " RCP           | 0.031  | 202            | 0.013   | 72                | 81                                   | 9   | 0.039      | 7.82         | 8.25  | 0.43 M   |
| O40a  | 33 " RCP           | 0.0042 | 710            | 0.013   | 34                | 35                                   | 1   | 0.004      | 3.09         | 4.98  | 1.89 M   |
| O40b  | (2) 54 " RCP       | 0.0095 | 635            | 0.013   | 383               | 430                                  | 47  | 0.012      | 7.56         | 8.04  | 0.48 M   |
| P10e1 | 42 " RCP           | 0.0113 | 281            | 0.013   | 107               | 135                                  | 28  | 0.018      | 5.03         | 5.18  | 0.14 M   |
| P10e2 | 42 " RCP           | 0.0127 | 281            | 0.013   | 113               | 137                                  | 24  | 0.018      | 5.18         | 5.57  | 0.39 M   |
| P10e3 | 42 " RCP           | 0.0261 | 308            | 0.013   | 162               | 187                                  | 25  | 0.034      | 10.57        | 10.03 | -0.54    |
| P10e4 | 42 " RCP           | 0.0182 | 301            | 0.013   | 136               | 187                                  | 51  | 0.034      | 10.33        | 7.47  | -2.86    |
| P10e5 | 42 " RCP           | 0.0145 | 189            | 0.013   | 121               | 187                                  | 66  | 0.034      | 6.49         | 4.74  | -1.75    |
| P15c  | 48 " RCP           | 0.0135 | 212            | 0.013   | 167               | 282                                  | 115 | 0.038      | 8.13         | 4.86  | -3.27    |
| P15e  | 24 " RCP           | 0.0076 | 1100           | 0.013   | 20                | 118                                  | 98  | 0.271      | 297.69       | 10.36 | -287.33  |
| P15f  | 54 " RCP           | 0.0132 | 606            | 0.013   | 226               | 420                                  | 194 | 0.045      | 27.50        | 10.00 | -17.50   |
| P15g  | (2) 57" X 38" CMPA | 0.01   | 610            | 0.024   | 132               | 476                                  | 344 | 0.130      | 79.19        | 8.10  | -71.09   |
| P20a  | 4 " X 8 " RCB      | 0.0031 | 456            | 0.013   | 247               | 476                                  | 229 | 0.009      | 4.10         | 3.41  | -0.69    |
| P20b  | 84 " CSP           | 0.001  | 562            | 0.013   | 202               | 507                                  | 305 | 0.006      | 3.52         | 2.56  | -0.96    |
| P20c  | 78 " CIP           | 0.001  | 66             | 0.013   | 166               | 515                                  | 349 | 0.010      | 0.64         | 2.07  | 1.43     |
| P20d  | (2) 4'X 5 ' RCB    | 0.001  | 145            | 0.013   | 155               | 520                                  | 365 | 0.008      | 1.16         | 2.15  | 0.99     |
| P20f  | (2) 5'X 5 ' RCB    | 0.001  | 65             | 0.013   | 155               | 524                                  | 369 | 0.004      | 0.28         | 2.07  | 1.79 M   |
| Q5b   | 33 " RCP           | 0.008  | 362            | 0.013   | 47                | 176                                  | 129 | 0.110      | 39.88        | 4.90  | -34.98   |
| Q5c   | 33 " RCP           | 0.01   | 380            | 0.013   | 53                | 230                                  | 177 | 0.188      | 71.49        | 5.80  | -65.69   |
| Q5d   | 36 " ACP           | 0.008  | 347            | 0.013   | 60                | 300                                  | 240 | 0.201      | 69.73        | 4.77  | -64.95   |
| Q10a  | 42 " RCP           | 0.0039 | 329            | 0.013   | 63                | 325                                  | 262 | 0.104      | 34.16        | 3.31  | -30.85   |
| Q10b  | 48 " RCP           | 0.004  | 375            | 0.013   | 91                | 340                                  | 249 | 0.056      | 20.89        | 3.50  | -17.39   |
| Q10c  | 48 " RCP           | 0.0060 | 649            | 0.013   | 111               | 365                                  | 254 | 0.064      | 41.69        | 5.91  | -35.79   |
| Q15a  | 48 " RCP           | 0.0075 | 302            | 0.013   | 124               | 425                                  | 301 | 0.087      | 26.34        | 4.27  | -22.07   |
| Q15b  | (2) 39 " RCP       | 0.0046 | 842            | 0.013   | 113               | 475                                  | 362 | 0.082      | 69.18        | 5.94  | -63.24   |
| Q20a  | (2) 42 " RCP       | 0.002  | 383            | 0.013   | 90                | 502                                  | 412 | 0.062      | 23.71        | 2.77  | -20.94   |
| Q25a  | 18 " RCP           | 0.0055 | 416            | 0.013   | 8                 | 20                                   | 12  | 0.036      | 15.01        | 4.29  | -10.72 M |
| Q25b  | 18 " RCP           | 0.0023 | 267            | 0.013   | 5                 | 36                                   | 31  | 0.117      | 31.25        | 2.62  | -28.64   |

M = DETERMINED AS MINOR DEFICIENCY

DETERMINATION OF MINOR DEFICIENCIES

| LINE  | SIZE               | SLOPE  | LENGTH<br>(FT) | N     | VALUE | CAPACITY<br>(CFS) | 100-YEAR DEFICIENCY<br>FLOW<br>(CFS) | Sf    | H1     | H2     | H2-H1   |
|-------|--------------------|--------|----------------|-------|-------|-------------------|--------------------------------------|-------|--------|--------|---------|
|       |                    |        |                |       |       |                   |                                      |       | Sf*L   | Sf*L+2 |         |
| Q25c  | 21 " ACP           | 0.005  | 825            | 0.013 | 11    | 40                | 29                                   | 0.063 | 52.32  | 6.13   | -46.19  |
| Q25d  | 21 " ACP           | 0.0066 | 69             | 0.013 | 13    | 45                | 32                                   | 0.080 | 5.51   | 2.45   | -3.06   |
| Q25e  | 33 " RCP           | 0.004  | 674            | 0.013 | 33    | 65                | 32                                   | 0.015 | 10.13  | 4.70   | -5.43   |
| Q25f  | 33 " RCP           | 0.005  | 20             | 0.013 | 37    | 75                | 38                                   | 0.020 | 0.40   | 2.10   | 1.70    |
| Q25g  | OPEN               | 0.003  | 650            | 0.03  |       | 581               |                                      | N/A   |        |        |         |
| Q25h  | b=6' h=4.5' RECT   | 0.003  | 620            | 0.015 | 322   | 600               | 278                                  |       |        |        |         |
| Q25i  | 42 " RCP           | 0.003  | 180            | 0.013 | 55    |                   |                                      | N/A   |        |        |         |
| Q25j  | 49" x 33" CMPA     | 0.003  | 86             | 0.024 | 24    |                   |                                      | N/A   |        |        |         |
| Q25k  | 42 " RCP           | 0.003  | 325            | 0.013 | 55    |                   |                                      | N/A   |        |        |         |
| Q25l  | b=3' h=[7] s=1.5:1 | 0.003  | 1570           | 0.03  |       |                   |                                      | N/A   |        |        |         |
| Q25p  | 18 " CMP           | 0.0256 | 116            | 0.024 | 9     |                   |                                      | N/A   |        |        |         |
| Q26a  | 18 " RCP           | 0.001  | 208            | 0.013 | 3     | 20                | 17                                   | 0.036 | 7.50   | 2.21   | -5.29   |
| Q30a  | 18 " RCP           | 0.0014 | 300            | 0.013 | 4     | 80                | 76                                   | 0.577 | 173.08 | 2.42   | -170.66 |
| Q30b1 | 28 " x 20 " CMPA   | 0.007  | 48             | 0.024 | 9     | 148               | 139                                  | 2.019 | 96.92  | 2.34   | -94.58  |
| Q30b2 | 28 " x 20 " CMPA   | 0.006  | 42             | 0.024 | 8     | 148               | 140                                  | 2.019 | 84.80  | 2.25   | -82.55  |
| Q30c  | 24 " CMP           | 0.006  | 462            | 0.024 | 9     | 148               | 139                                  | 1.451 | 670.36 | 4.77   | -665.59 |
| Q30d  | 24 " CMP           | 0.006  | 98             | 0.024 | 9     |                   |                                      | N/A   |        |        |         |
| Q30e  | 24 " CMP           | 0.0058 | 208            | 0.024 | 9     |                   |                                      | N/A   |        |        |         |
| Q30f  | 36 " CMP           | 0.0045 | 448            | 0.024 | 24    |                   |                                      | N/A   |        |        |         |
| Q30g  | 64 " x 43 " CMPA   | 0.0025 | 1232           | 0.024 | 44    |                   |                                      | N/A   |        |        |         |
| Q30h  | 71 " x 47 " CMPA   | 0.0025 | 664            | 0.024 | 57    |                   |                                      | N/A   |        |        |         |
| Q30i  | (2) 54 " RCP       | 0.003  | 2500           | 0.013 | 215   |                   |                                      | N/A   |        |        |         |
| Q31a  | 64 " x 43 " CMPA   | 0.008  | 12             | 0.024 | 79    | 628               | 549                                  | 0.506 | 6.07   | 2.10   | -3.98   |
| Q31c1 | 30 " CMP           | 0.0024 | 448            | 0.024 | 11    |                   |                                      | N/A   |        |        |         |
| Q31c2 | 24 " CMP           | 0.004  | 540            | 0.024 | 8     |                   |                                      | N/A   |        |        |         |
| Q31c3 | 30 " CMP           | 0.0025 | 276            | 0.024 | 11    |                   |                                      | N/A   |        |        |         |
| Q31d  | 50 " x 31 " CMPA   | 0.0025 | 751            | 0.024 | 22    |                   |                                      | N/A   |        |        |         |
| Q31e  | 49 " x 33 " CMPA   | 0.0025 | 282            | 0.024 | 22    |                   |                                      | N/A   |        |        |         |
| Q31f  | 64 " x 43 " CMPA   | 0.0062 | 130            | 0.024 | 69    |                   |                                      | N/A   |        |        |         |
| R5a   | 27 " RCP           | 0.003  | 307            | 0.013 | 17    | 27                | 10                                   | 0.008 | 2.32   | 2.92   | 0.60 M  |
| R5b   | 33 " RCP           | 0.0048 | 333            | 0.013 | 37    | 47                | 10                                   | 0.008 | 2.62   | 3.60   | 0.98 M  |
| R5c   | 33 " RCP           | 0.003  | 296            | 0.013 | 29    | 54                | 25                                   | 0.010 | 3.07   | 2.89   | -0.18 M |
| R10a  | 36 " RCP           | 0.002  | 315            | 0.013 | 30    | 61                | 31                                   | 0.008 | 2.62   | 2.63   | 0.01 M  |
| R10b  | 24 " RCP           | 0.0017 | 253            | 0.013 | 9     | 90                | 81                                   | 0.157 | 39.83  | 2.43   | -37.40  |
| R20a  | 54 " RCP           | 0.0023 | 500            | 0.013 | 94    | 100               | 6                                    | 0.003 | 1.29   | 3.15   | 1.86 M  |
| S15b  | 35 " x 24 " CMPA   | 0.0036 | 178            | 0.024 | 11    | 28                | 17                                   | 0.024 | 4.28   | 2.64   | -1.64   |
| S15c  | 30 " RCP           | 0.005  | 277            | 0.013 | 29    | 70                | 41                                   | 0.029 | 8.01   | 3.38   | -4.63   |
| S15d  | 36 " RCP           | 0.005  | 159            | 0.013 | 47    | 95                | 48                                   | 0.020 | 3.20   | 2.79   | -0.41   |
| S15e  | 48 " RCP           | 0.0026 | 847            | 0.013 | 73    | 110               | 37                                   | 0.006 | 4.94   | 4.20   | -0.74   |
| S15f  | 48 " RCP           | 0.0049 | 280            | 0.013 | 101   | 120               | 19                                   | 0.007 | 1.95   | 3.37   | 1.43 M  |
| T5c   | 30 " RCP           | 0.01   | 253            | 0.013 | 41    | 62                | 21                                   | 0.023 | 5.76   | 4.53   | -1.22   |
| T5d   | (2) 24 " RCP       | 0.01   | 88             | 0.013 | 45    | 62                | 17                                   | 0.019 | 1.65   | 2.88   | 1.23 M  |
| U5a1  | 43 " x 27 " CMPA   | 0.013  | 72             | 0.024 | 35    | 64                | 29                                   | 0.044 | 3.17   | 2.93   | -0.24   |
| U5a2  | 43 " x 27 " CMPA   | 0.016  | 49             | 0.024 | 38    | 64                | 26                                   | 0.044 | 2.15   | 2.78   | 0.63    |
| U20a  | 28 " x 20 " CMPA   | 0.0051 | 1166           | 0.024 | 7     | 58                | 51                                   | 0.310 | 361.57 | 7.95   | -353.62 |
| U20b  | 30 " CMP           | 0.0037 | 394            | 0.024 | 14    | 68                | 54                                   | 0.093 | 36.71  | 3.46   | -33.25  |
| U20c  | 28 " x 20 " CMPA   | 0.0018 | 108            | 0.024 | 4     | 15                | 11                                   | 0.021 | 2.24   | 2.19   | -0.05 M |
| U20d  | 43 " x 27 " CMPA   | 0.0018 | 450            | 0.024 | 13    | 15                | 2                                    | 0.002 | 1.09   | 2.81   | 1.72 M  |
| V30a1 | b=10 h=4.5 s=1.5:1 | 0.005  | 100            | 0.015 | 1067  | 1175              | 108                                  |       |        |        | M       |

M = DETERMINED AS MINOR DEFICIENCY

DETERMINATION OF MINOR DEFICIENCIES

| LINE  | SIZE              | SLOPE  | LENGTH<br>(FT) | N VALUE | CAPACITY<br>(CFS) | 100-YEAR DEFICIENCY<br>FLOW<br>(CFS) | Sf  | H1<br>Sf*L | H2<br>So*L+2 | H2-H1         |
|-------|-------------------|--------|----------------|---------|-------------------|--------------------------------------|-----|------------|--------------|---------------|
| V30a2 | OPEN              | 0.019  | 200            | 0.03    |                   | 1175                                 |     |            |              | b=12          |
| V40d  | (2) 10' x 4' RCB  | 0.0062 | 74             | 0.013   | 913               | 1381                                 | 468 | 0.008      | 0.58         | 2.46          |
| V45d  | b=5' h=5' s=1.5:1 | 0.0181 | 800            | 0.03    | 810               | 1387                                 | 577 |            |              |               |
| V45e1 | (2) 6' X 5' RCB   | 0.0089 | 150            | 0.013   | 796               | 1387                                 | 591 | 0.018      | 2.64         | 3.34          |
| V45e2 | (2) 6' X 5' RCB   | 0.0192 | 96             | 0.013   | 1169              | 1387                                 | 218 | 0.018      | 1.69         | 3.84          |
| V45k  | [b=7 h=5 s=1.5:1] | 0.006  | 400            | 0.03    |                   | 1472                                 | N/A |            |              | b=1           |
| X15a  | (2) 3.5' X 6' RCB | 0.01   | 50             | 0.013   | 513               | 995                                  | 482 | 0.029      | 1.43         | 2.50          |
| Y15a  | 36 " RCP          | 0.0138 | 232            | 0.013   | 78                | 289                                  | 211 | 0.187      | 43.32        | 5.20          |
| Y15b  | 48 " CIP          | 0.0395 | 563            | 0.013   | 285               | 289                                  | 4   | 0.040      | 22.66        | 24.23         |
| Y15g1 | 28 " x 20 " CMPA  | 0.0245 | 72             | 0.024   | 16                | 27                                   | 11  | 0.067      | 4.84         | 3.76          |
| Y15g2 | 24 " CMP          | 0.035  | 100            | 0.024   | 23                | 27                                   | 4   | 0.048      | 4.83         | 5.50          |
| Y15h  | 18 " RCP          | 0.005  | 58             | 0.013   | 7                 | 13                                   | 6   | 0.015      | 0.88         | 2.29          |
| Z25h  | 18 " CMP          | 0.039  | 40             | 0.024   |                   | 359                                  | N/A | 39.598     | 1583.92      | 3.56 -1580.36 |
| Z25i  | OPEN              | 0.039  | 400            | 0.03    |                   | 359                                  | N/A |            |              |               |

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BSI CONSULTANTS, INC.

