TENTATIVE PLAN DRAINAGE STUDY
for
GARRISON ELEMENTARY SCHOOL

Garrison Street
APN: 162-020-24-00 & 162-030-14-00

City of Oceanside, California

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1. Introduction

1.1. Scope of Work

The purpose of this study is to provide hydrology calculations in support of a proposed residential development in the City of Oceanside, California. This report will quantify runoff for the 100-year frequency storm event and recommend storm drain infrastructure needed to convey stormwater through the site safely. Treatment of stormwater runoff from the site has been addressed in a separate report entitled “PDP Stormwater Quality Management Plan for Garrison Elementary School” prepared by Hunsaker & Associates, San Diego, and dated May 2024.

1.2. Existing Condition

The Garrison Elementary School property is an 8.32-acre site located at 333 Garrison Street, in the City of Oceanside, San Diego County, California. The site is currently occupied by the former E. G. Garrison Elementary School, which has now been abandoned. Current site improvements include ten (10) classroom buildings, a miscellaneous-use building, paved parking, sporting fields and drive isle areas, as well as landscaping and hardscaping areas. The northern portion of the site is vacant of structures and graded. Refer to the project vicinity map located in appendix 1.

An existing paved driveway off Garrison Street provides access to the property. To the north, the boundary is defined by a vacant, mass-graded pad. Vegetated slopes delineate the eastern edge, while Garrison Street lies to the west. A multifamily residential development borders the property to the south.

The drainage area under study encompasses approximately 10.70 acres, including an offsite area of 2.58 acres, with a total imperviousness of 40%. Of this offsite area, 2.06 acres are located to the north and east of the property and drain through the project site, merging with the northern onsite drainage. This commingled runoff then flows southeasterly towards an existing Type G catch basin (Node 106) located offsite. This catch basin collects the combined flows from the onsite central drainage area, which are channeled by an existing 30-inch RCP, and from western offsite flows entering the onsite storm drain system through two storm inlets (as per Inlet Apron for Culvert per As-built GP 28110) and a Type F catch basin (as per Improvement Plans R-02993-R-03010C). Subsequently, the total flow is directed easterly beneath Garrison Street via existing 22”X36” CMP arch per DWG R-2258, to discharge into Garrison Creek (Node 124) and eventually into Loma Alta Creek.

Runoff from the southern portion of the site drains southward, collected by existing catch basins (Brooks boxes), and is then routed to the existing 18” storm drain as per As-built GP 28110 (at Node 310). This 18” storm drain discharges into the offsite southern parking lot (Node 312), where the water first surface flows and then is channeled through the existing parking lot gutter to an existing catch basin. It then crosses Garrison Street to eventually discharge into Garrison Creek and subsequently into Loma Alta Creek.

Runoff from the southeastern portion of the site is conveyed via surface flow in a southeast direction towards Garrison Street (Node 204). There, it travels southward along the street's curb and gutter system for [insert distance] feet before being interrupted by a Type B curb inlet, as detailed in DWG R-02611. From this point, it travels easterly via 18" RCP pipe, crossing Garrison Street, and empties into Garrison Creek as per DWG R-01054, eventually flowing into Loma Alta Creek.

Loma Alta Creek then flows westerly, ultimately discharging into the Pacific Ocean via the Loma Alta Slough.

See **Appendix 4** for calculations of existing peak runoff from the site.

According to the FEMA Flood Insurance Rate Map (FIRM) 06073C0754H effective 05/16/2012, the project is in an unshaded Zone X, which is defined as "Areas determined to be outside the 500-year floodplain". Refer to the FIRMette Map in **Appendix 1**.

According to the Natural Resources Conservation Service (NRCS) Soil Report, the predominant soil type across the site falls under Hydrologic Soil Group "D," except for a 0.035-acre area classified within Hydrologic Soil Group "C." Soil D was assumed for the entire site. for detailed NRCS soil information, please see Appendix 2.

The runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1)

Cp Soil D= 0.35

Please refer to existing conditions AES Input Data spreadsheet in appendix 4 for each subarea runoff factor.

Table 1 below summarizes the 100-year existing condition peak flow at the downstream project boundary.

TABLE 1 - Summary of Existing Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	Tc (min)	Q100-Year Peak Flow (cfs)
1	124	Southeast of the site to Garrison creek	8.13	8.66	12.87
1	204	Southeast of the site to Garrison Street	1.03	4.01	5.34
1	312	Southwest of the site	1.42	7.53	4.46
Total Area			10.69 acres		

1.3 Proposed Condition

The proposed project is a 140-unit townhome development consisting of multi-family structures, driveways, access roads, sidewalks, landscaped areas, and open space areas. The infrastructure will consist of streets and associated utilities including dual storm drain system (pipes, inlets, catch basins, brow ditches and cleanouts). One of the dual systems is necessary to collect and convey the onsite 100-year runoff through the project area to the proposed underground storage facility (CMP or equivalent). The second system (bypass storm drain system) is to replace the existing 30” storm drain that runs through the site and conveys the offsite flows and part of the onsite flows to the existing eastern channel. The existing 30” storm drain will be removed.

Onsite runoff will be conveyed via the street curb and gutter system, captured by the proposed inlets, and then routed through the proposed storm drain system to the previously mentioned underground storage facility (Node 146). This facility is specifically designed to store the designated capture volume and regulate flows to the downstream proprietary biofiltration Best Management Practice (BMP) to meet water quality requirements. Additionally, the underground storage facility will provide essential storage and flow control for hydromodification management and attenuate the 100-year peak flows. Finally, the discharge from the underground storage facility and the proprietary biofiltration BMP will be directed to the existing 22” x 36” Corrugated Metal Pipe (CMP) arch, subsequently flowing into Garrison Creek (Node 107).

Runoff from 0.05 ac of the entrance, drain towards Garrison Street and will be captured by the existing inlet and discharge into Garrison Creek, similarly to existing conditions. Permeable pavers are proposed to address the water quality requirements for the said area (please note that this water quality solution is preliminary, and a discussion will be processed with the city). For additional discussion on the proposed water quality features of the site, refer to the Stormwater Quality Management Plan for Garrison Elementary School (November 2024) prepared by Hunsaker & Associates San Diego, Inc.

Runoff from the western undisturbed slopes will be routed via proposed brow ditches to enter the proposed bypassed storm drain system via catch basins. The proposed bypass storm drain system will convey the mentioned flows with the offsite flows (captured by the existing headwalls and catch basins) to the respected discharge point southeast of the site, where it comingles with the onsite treated flows (at 119) and continues easterly to the analyzed discharge point (at Node 107). See **Appendix 4** for calculations of proposed condition run-off.

EL Corazon Lift Station

The City of Oceanside, in collaboration with X Engineering & Consulting, Inc., is currently advancing the expansion of the Mission Basin groundwater purification facility. As part of this development, a sewer lift station is proposed north of the site and is currently in the final engineering stage. It is expected that the lift station will be constructed prior to the commencement of this multi-family project.

However, since the lift station is designed to address its own water quality, detention, and hydromodification requirements, it is not included as part of the analysis conducted in this drainage study. The requirements for our project, along with the lift station project, are to maintain peak flows at discharge locations consistent with existing conditions, ensuring no impact on the capacity of downstream systems.

The total drainage area under investigation is 10.71 acres. For the onsite subareas, the runoff coefficient was sourced from Table 3-1, which pertains to high-density residential areas with Soil Group D and was established as 0.79. For the offsite areas, runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2

C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1) Cp Soil D= 0.35

Please refer to proposed conditions AES Input Data spreadsheet in appendix 4 for each subarea runoff factor.

Table 2 below summarizes the unmitigated 100-year proposed condition peak flow at the downstream project boundary.

TABLE 2 - Summary of Proposed Unmitigated Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	Tc (min)	Q100-Year Peak Flow (cfs)
1	107	Southeast of the site to Garrison creek	9.91	8.90	31.67
1	204	Southeast of the site to Garrison Street	0.43	5.20	2.00
1	304	Southwest of the site	0.37	8.44	0.66
Total Area			10.71 acres		

Due to the increased flow associated with the development of *the project*, peak flow attenuation will be achieved by the proposed underground storage facility (CMP). The riser within the CMP has been sized and designed to include orifices along its height. Sizes and heights of orifices were determined to achieve outlet flow less than the existing flow shown on Table 1 above. Please refer to Chapter 2.2 for methodology and Appendix 5 for detention Analysis. The resultant discharge at Node 107 will continue easterly to Garrison Creek, then to Loma Alta Creek and ultimately discharging into the Pacific Ocean via the Loma Alta Slough.

Since this project is subject to comply with hydromodification requirements, the design of the CMP has been coordinated with those calculations, which are part of the *SWQMP for Garrison Elementary School.*

Table-3 below summarizes the Q100 Mitigated flow at Node 107.

TABLE 3 - Summary of Mitigated Developed Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	Average Runoff Coefficient	Tc (min)	Q100-Year Peak Flow (cfs)
1	107	Southeast of the site to Garrison creek	9.91	0.69	16.07	10.85

2. Methodology

2.1 Modified Rational Method Hydrologic Analysis

Computer Software Package – AES-2015

Design Storm - 100- year return interval.

Land Use –High Density Residential

Soil Type – According to the Natural Resources Conservation Service (NRCS) Soil Report, the predominant soil type across the site falls under Hydrologic Soil Group "D," except for a 0.035-acre area classified within Hydrologic Soil Group "C." Soil D was assumed for the entire site.

Runoff Coefficient - In accordance with the County of San Diego standards, runoff coefficient for each subarea was calculated based on soil type and impervious percentage using the formula from San Diego County Hydrology Manual Section 3.1.2
C= 0.90 x (% Impervious) + Cp x (1 - % Impervious)

Cp = Pervious Coefficient Runoff value for the soil type (per San Diego County Hydrology Manual Table 3.1)
Cp Soil D= 0.35

Rainfall Intensity- The rainfall intensity is determined per the San Diego County Hydrology Manual based on 6-hour precipitation amounts and calculated time of concentrations. Six-hour precipitations are taken from the San Diego County Hydrology Manual isopluvials. P6=2.70 inch

Method of Analysis – The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 1.0 square miles, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the equation:

Q = CIA, where:

Q = The peak runoff rate in cubic feet per second at the point of analysis.

C = A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.

I = The time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.

A = The drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas, which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

(1) Subdivide the watershed into subareas with the initial subarea being less than 10 acres in size (generally one lot will do), and subsequent subareas gradually increasing in size. Assign upstream and downstream nodal numbers to each subarea to correlate calculations to the watershed map.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to the channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2003 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipe flow travel time (computer estimated).
4. Pipe flow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through the area.
10. Copy mainstream data to memory bank.
11. Confluence mainstream data with a memory bank

12. Clear a memory bank.

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment assumes that each basin's hydrographs are triangular.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$Q_p = Q_a + Q_b$; $T_p = T_a = T_b$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

$Q_p = Q_a + Q_b \ (I_a/I_b)$; $T_p = T_a$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$Q_p = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

Underground storm drains are analyzed in a similar way. Flow data obtained from the surface model for inlets and collection points are input into the nodes representing those structures. Design grades and lengths are used to compute the capacity of the storm drains and to model the downstream travel times.

2.2 Detention Analysis

To provide adequate flood control, increases in peak flow rates at the outfall location for this site were mitigated using the proposed underground storage facility.

The hydrology calculations discussed above provide peak flowrates for the CMP's inflow, which are entered into a separate program called RickRatHydro. The RickratHydro was used to produce an inflow hydrograph for the project drainage area to the biofiltration basin, based on the area, time of concentration, P6 value, runoff coefficient, and peak flow rate.

Mitigation within the CMP was modeled using SWMM 5.1. The Hydrograph that was generated from RickRatHydro was used as an input data for the inflows to the storage unit in the SWMM model. The riser was modeled using the stage discharge table (Rating Curve in SWMM), and the volume was modeled using the storage stage table

(Storage Curve), which represents the storage provided within the CMP excluding the water quality ponding depth.

The results from the SWMM model were used as input data (code 7) in the AES proposed condition model at the discharge location from the proposed underground storage facility (Node 146), to generate the AES model for proposed mitigated flows.

3 Results

Conveyance of Q100 runoff flows through the proposed site required dual storm drain system. One of the dual systems is 18” storm drain system proposed to route flows (onsite) to the underground storage facility to address water quality, hydromodification and peak flow attenuation; while the second system is 30” bypassed storm drain to replace the existing 30” storm drain that runs through the site and conveys the offsite flows and part of the onsite undisturbed slopes to the existing eastern channel.

Storm drain system and hydraulic calculations will be conducted as part of the final engineering drainage study.

One underground storage facility was included in the design of the site to address hydromodification, peak flow attenuation, and water quality requirements. A proprietary biofiltration BMP is proposed downstream of the underground storage facility to address water quality requirements for most of the site. Preliminary, permeable pavement was sized for the two areas (total of 0.05 ac) that cannot be routed to the underground storage facility. Per the hydrologic and detention analysis conducted as part of this study, the detention analysis for the basin is included in Appendix 5 of this report. The table below summarizes the flow reductions at the discharge location.

The flow from the site is attenuated to make sure that the post-developed flows will not exceed the capacity of the existing downstream drainage facilities (post development flows compared to the existing flows at the point of compliance southwest corner of the project (POC-1/ Node 119). See table 4 in the next sheet.

TABLE 4 – Existing Condition vs. Post-development Condition

Discharge Location	Pre-Area (ac)	Post-Area (ac)	Pre-: 100-Year Peak Flow (cfs)	Post-: 100-Year Unmit. Peak Flow (cfs)	Post-: 100-Year Mit. Peak Flow (cfs)	TC Pre (min)	TC Post Unmit. (min)	TC Post Mit. (min)	Q100 Flow Difference (cfs)
Southeast of the site to Garrison Creek	8.13	9.91	12.87	31.67	10.85	8.66	8.90	16.07	-1.97
Southeast of the site to Garrison Street	1.03	0.43	5.34	2.00	N/A	4.01	5.20	N/A	-3.34
Southwest of the site	1.53	0.37	4.52	0.66	N/A	7.53	8.44	N/A	-3.86

-Pre : Pre-Developed Conditions
-Post. Unmit.: Post Developed Unmitigated Conditions
-Post. Mit.: Post Developed Mitigated Condition

4. Conclusions

The proposed redevelopment of Garrison School Site can be roughly graded and improved with storm drain to accommodate the ultimate expected flows from development. In addition, with the proposed drainage facilities such as curb inlets, storm drain, water quality, flow control and detention facility, runoff can be mitigated to accepted San Diego County and City of Oceanside standards.

The proposed project will not substantially alter the existing drainage pattern of the site. There will be a decrease in the peak discharge from the site. Therefore, the proposed project will not impact downstream properties or drainage facilities.

5. References

San Diego County Hydrology Manual, County of San Diego Department of Public Works Flood Control Division, June 2003.

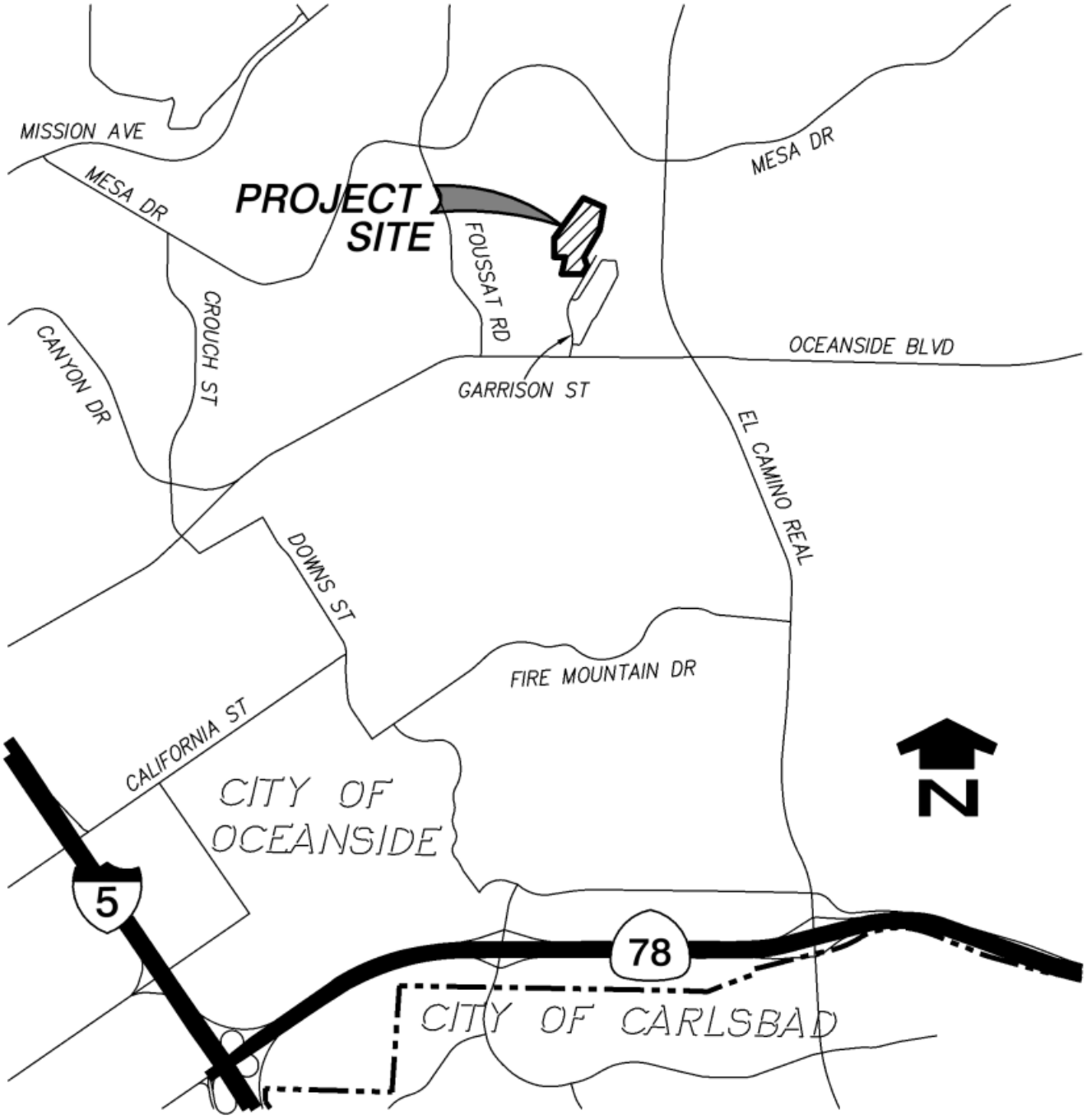
San Diego County Hydraulic Design Manual, County of San Diego Department of Public Works Flood Control Division, September 2014

San Diego County Drainage Design Manual, County of San Diego Department of Public Works Flood Control Division, July 2005

Stormwater Quality Management Plan for Garrison Elementary School, Hunsaker & Associates San Diego, Inc., November 2024.

Appendix 1 – Vicinity Map and FIRM Map

Vicinity Map



VICINITY MAP

NOT TO SCALE

National Flood Hazard Layer FIRMette

FEMA

117°20'30"W 33°12'33"N

117°19'53"W 33°12'3"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

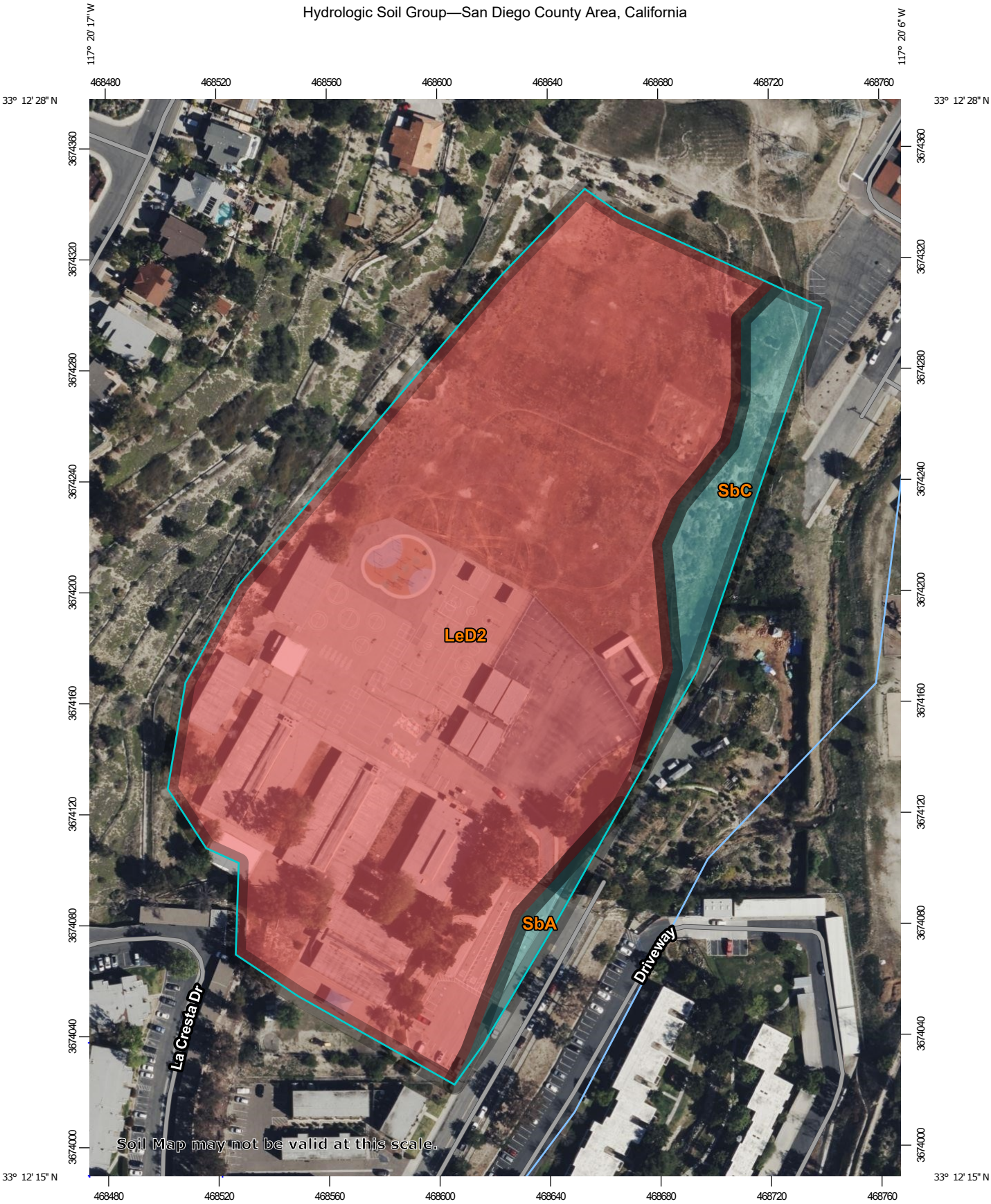
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/22/2023 at 1:58 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix 2 - Soils Information

Hydrologic Soil Group—San Diego County Area, California



Map Scale: 1:1,890 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 19, Aug 30, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	D	9.3	91.0%
SbA	Salinas clay loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	0.2	1.7%
SbC	Salinas clay loam, 2 to 9 percent slopes	C	0.7	7.3%
Totals for Area of Interest			**10.3**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix 3 – Runoff Coefficient Determination

- The storm frequency of peak discharges is the same as that of I for the given T_c.

- The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in Section 4.1.2.4).

- The peak rate of runoff is the only information produced by using the RM.

3.1.2 Runoff Coefficient

Table 3-1 lists the estimated runoff coefficients for urban areas. The concepts related to the runoff coefficient were evaluated in a report entitled *Evaluation, Rational Method "C" Values* (Hill, 2002) that was reviewed by the Hydrology Manual Committee. The Report is available at San Diego County Department of Public Works, Flood Control Section and on the San Diego County Department of Public Works web page.

The runoff coefficients are based on land use and soil type. Soil type can be determined from the soil type map provided in Appendix A. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient ($\Sigma[CA]$). Good engineering judgment should be used when applying the values presented in Table 3-1, as adjustments to these values may be appropriate based on site-specific characteristics. In any event, the impervious percentage (% Impervious) as given in the table, for any area, shall govern the selected value for C. The runoff coefficient can also be calculated for an area based on soil type and impervious percentage using the following formula:

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where: C_p = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

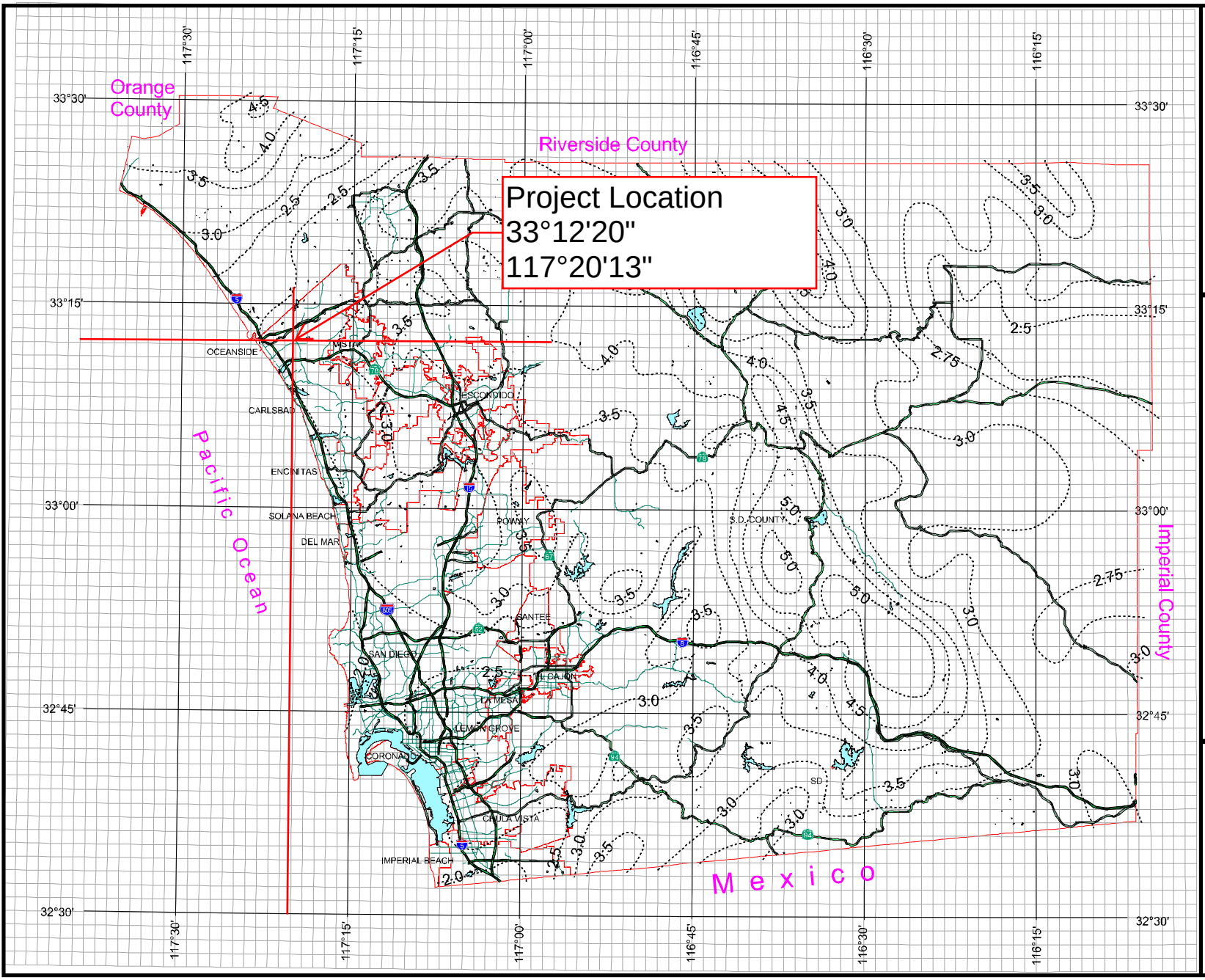
The values in Table 3-1 are typical for most urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the local agency.

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Appendix 4 –Desing Rainfall Determination



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6=2.70

DPW GIS
Department of Public Works
Geographic Information Services

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3 0 3 Miles

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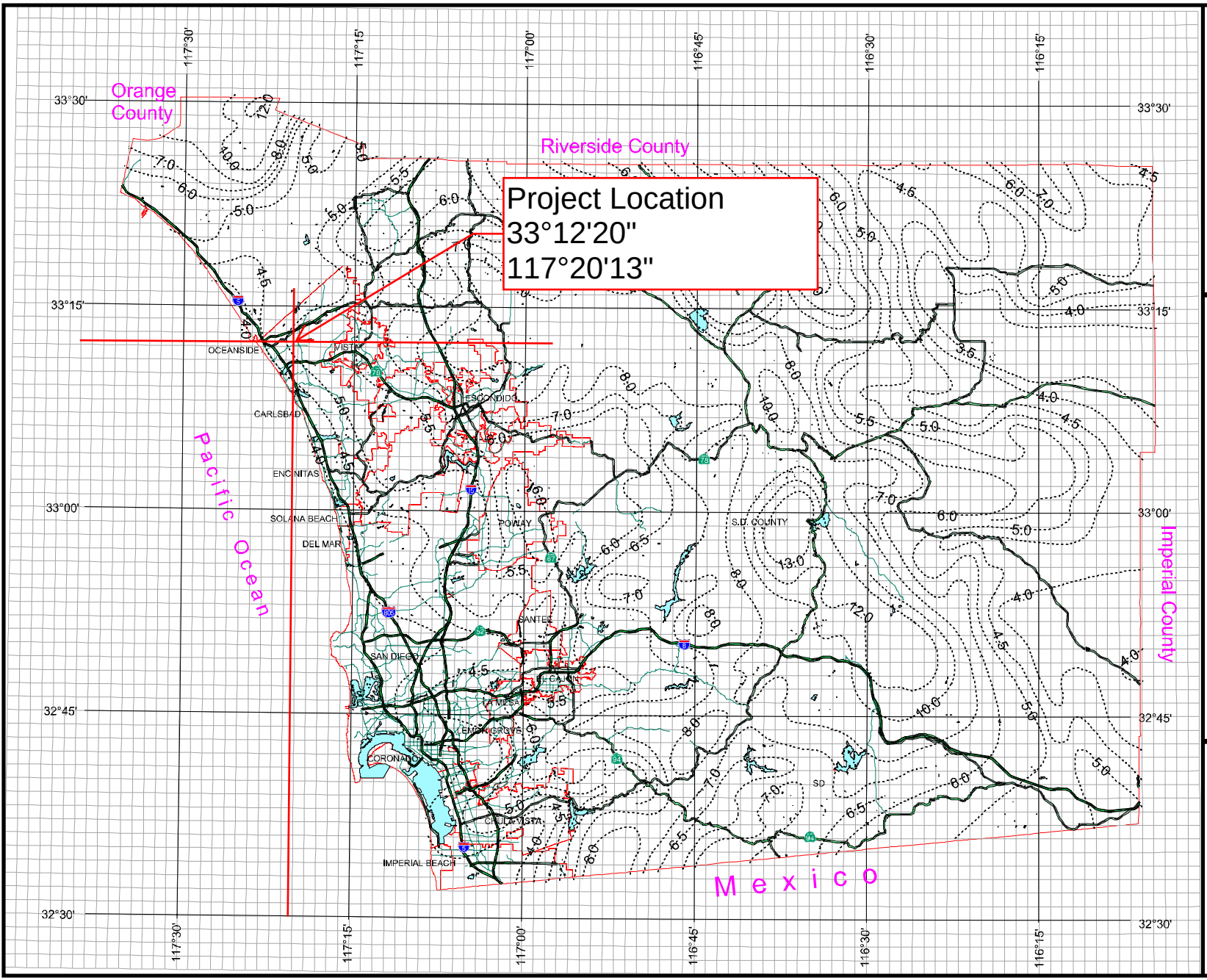

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24=5.05

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
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N
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S

3 0 3 Miles

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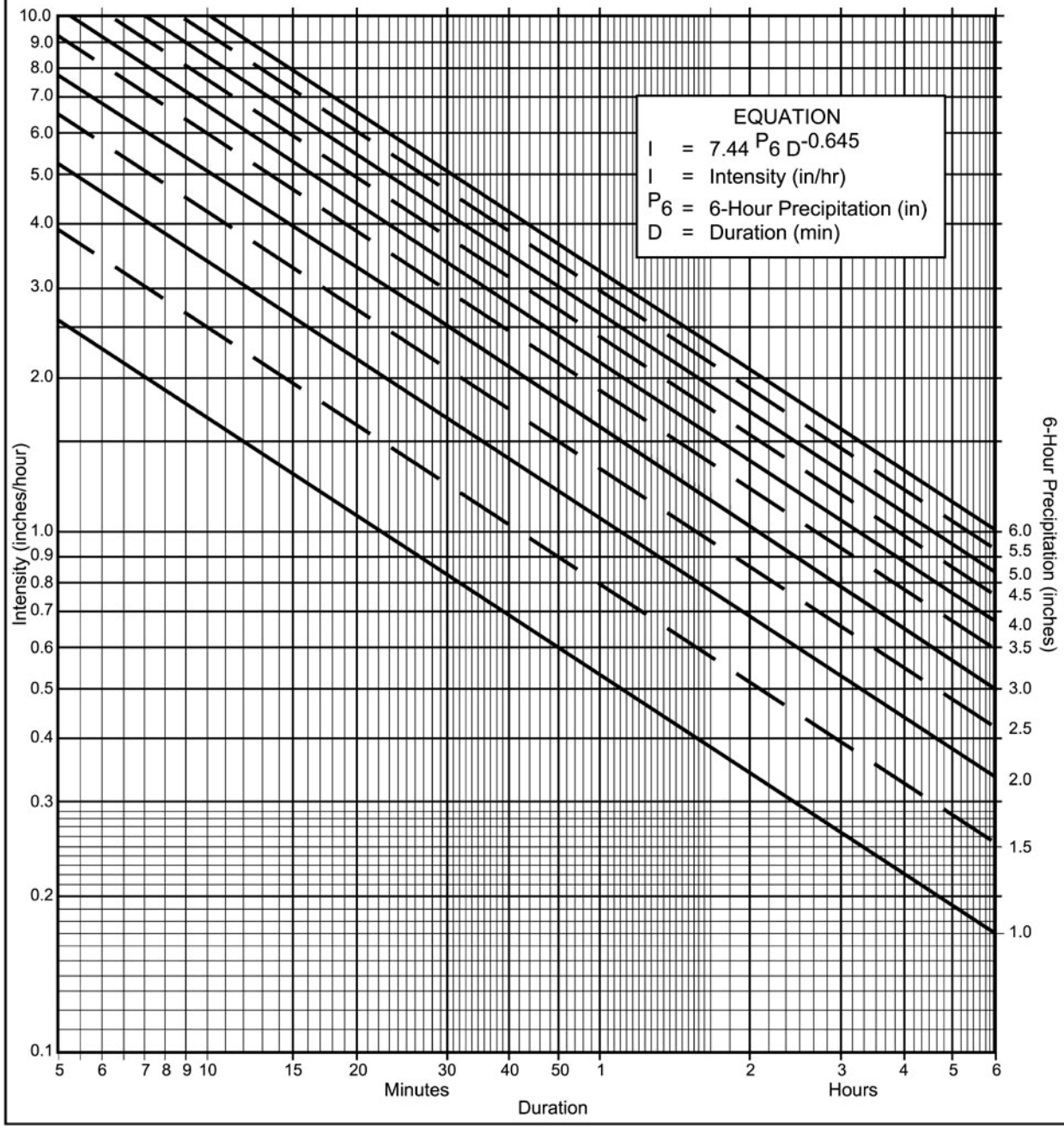


Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included 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 applicaple 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:

(a) Selected frequency 100 year

(b) P_6 = 2.70 in., P_{24} = 5.05, $\frac{P_6}{P_{24}} = \frac{2.70}{5.05}$ %(2) 53%

(c) Adjusted $P_6^{(2)}$ = 2.70 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

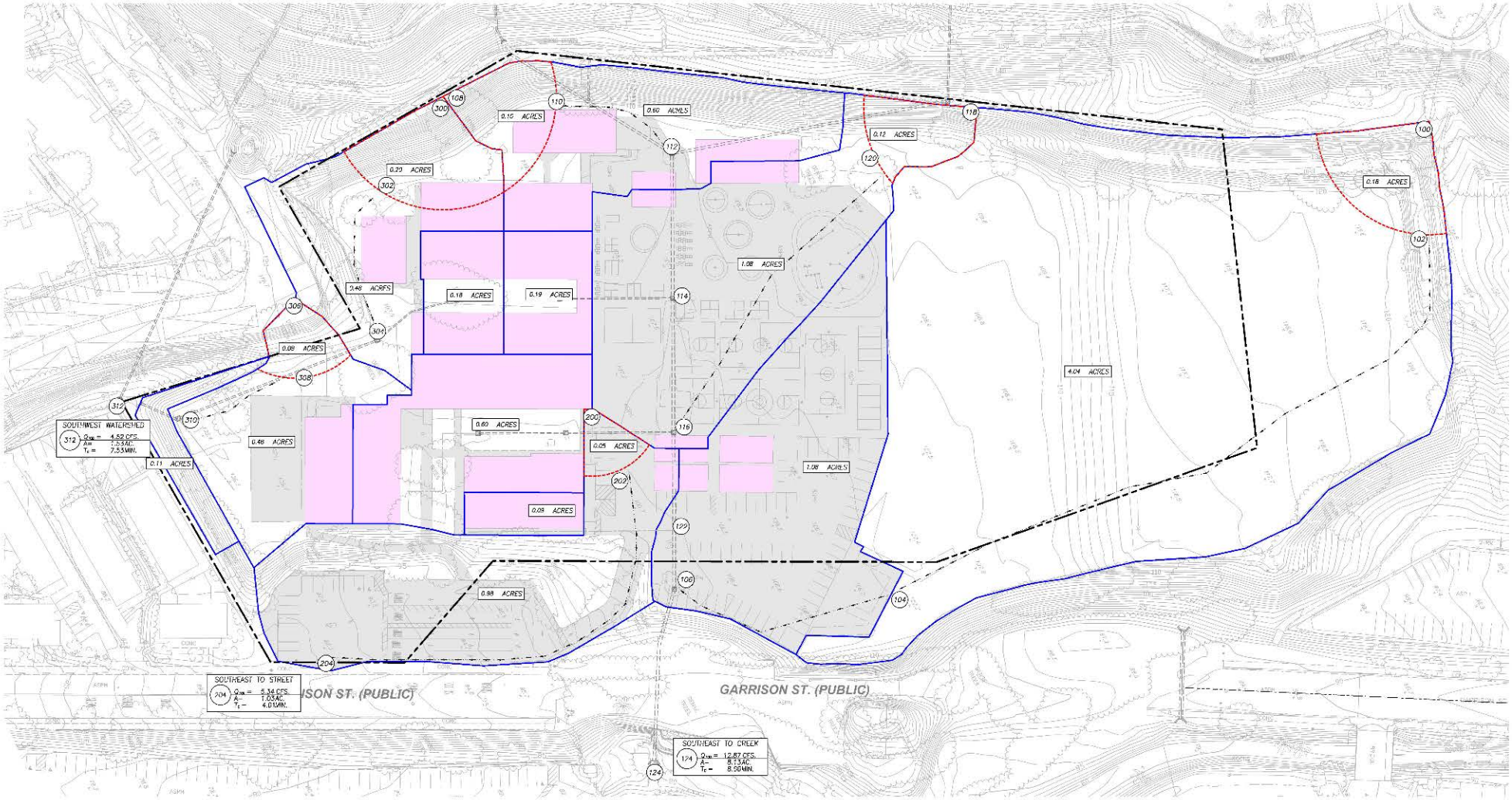
Intensity-Duration Design Chart - Template

FIGURE

3-1

Appendix 5 –Hydrologic Calculations and Exhibits

EXISTING CONDITION



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING BUILDING
- EXISTING HARDSCAPE
- EXISTING STORM DRAIN
- EXISTING AREA DRAIN SYSTEM

SCALE: 1" = 40'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.

PLANNING: 9707 Waples Street
ENGINEERING: San Diego, Ca 92121
SURVEYING: PHONE:858-4506 · FAX:858-4504

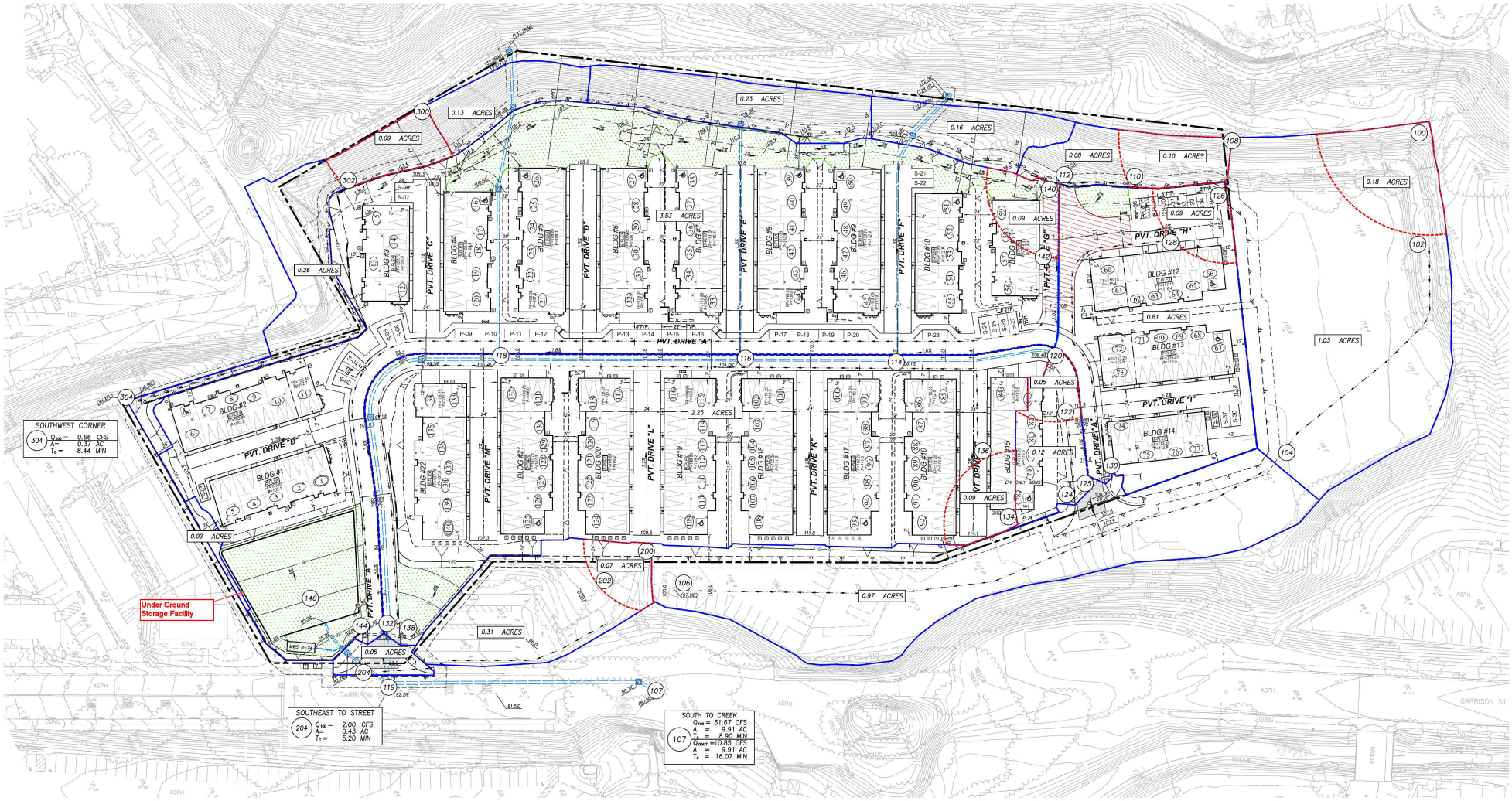
EXISTING DRAINAGE MAP

GARRISON ELEMENTARY SCHOOL

CITY OF OCEANSIDE, CALIFORNIA

MAP 1 OF 2

R:\1778\Hyd\DR\CAD\1778[Hydro-EX.dwg]Jul-03-2024:12:25



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING HARDSCAPE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN

40 0 40 80 120
SCALE 1"= 40'

PREPARED BY:		MAP
HUNSAKER & ASSOCIATES SAN DIEGO, INC PLANNING 9707 Waples Street ENGINEERING San Diego, Ca 92121 SURVEYING PH(858)558-4500- FX(858)558-1414	PROPOSED DRAINAGE MAP GARRISON ELEMENTARY SCHOOL CITY OF OCEANSIDE, CALIFORNIA	2 OF 2

R.O.# 3214-0002

R:\1778\Hyd\DR\CAD\1778-Hydro-PR.dwg[]Apr-14-2025:16:59

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                           Analysis prepared by:

                    Hunsaker & Associates San Diego, Inc.
                              9707 Waples Street
                             San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* GARRISON ELEMENTARY SCHOOL                                             *
* EXISTING CONDITIONS - 100-YEAR                                         *
* DLN 1778, W.O. 3214-0002                                               *
 ************************************************************************

  FILE NAME: R:\1778\HYD\DR\CALCS\AES\100EX.DAT
  TIME/DATE OF STUDY: 11:00 12/22/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   13.5      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| BEGIN North to south WATERSHED ANALYSIS                                  |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    139.00
  DOWNSTREAM ELEVATION(FEET) =    128.40
  ELEVATION DIFFERENCE(FEET) =     10.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
```

```
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    128.40  DOWNSTREAM(FEET) =    107.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   613.00   CHANNEL SLOPE =  0.0349
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.713
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.64
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =  16.02
  Tc(MIN.) =   22.29
  SUBAREA AREA(ACRES) =     4.04       SUBAREA RUNOFF(CFS) =    3.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.2         PEAK FLOW RATE(CFS) =       4.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   0.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     713.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    107.00
  DOWNSTREAM NODE ELEVATION(FEET) =    104.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.125   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.631
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      5.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.10
  AVERAGE FLOW DEPTH(FEET) =   0.31   FLOOD WIDTH(FEET) =   16.14
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =   23.37
  SUBAREA AREA(ACRES) =    1.08       SUBAREA RUNOFF(CFS) =    2.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.462
  TOTAL AREA(ACRES) =        5.3         PEAK FLOW RATE(CFS) =       6.44

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOOD WIDTH(FEET) =   18.17
  FLOW VELOCITY(FEET/SEC.) =   3.13   DEPTH*VELOCITY(FT*FT/SEC) =   1.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     913.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4600
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    136.00
  DOWNSTREAM ELEVATION(FEET) =    110.00
  ELEVATION DIFFERENCE(FEET) =     26.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.348
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.812
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    110.00  DOWNSTREAM(FEET) =    107.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   116.00   CHANNEL SLOPE =  0.0207
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.191
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.26
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   0.85
  Tc(MIN.) =    6.20
  SUBAREA AREA(ACRES) =     0.60       SUBAREA RUNOFF(CFS) =    2.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.588
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   2.75
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     216.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   104.40  DOWNSTREAM(FEET) =   102.50
  FLOW LENGTH(FEET) =   127.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.73
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    6.57
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    114.00 =     343.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.962
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6268
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.88
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.51
  TC(MIN.) =    6.57

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   102.50  DOWNSTREAM(FEET) =    99.90
  FLOW LENGTH(FEET) =   119.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.97
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.51
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.86
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     462.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.801
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6748
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.61
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       6.03
  TC(MIN.) =    6.86

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.86
  RAINFALL INTENSITY(INCH/HR) =   5.80
  TOTAL STREAM AREA(ACRES) =     1.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.03

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    126.00
  DOWNSTREAM ELEVATION(FEET) =    109.00
  ELEVATION DIFFERENCE(FEET) =     17.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    116.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    109.00
  DOWNSTREAM NODE ELEVATION(FEET) =    106.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   294.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.125   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.156
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8400
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.49
  AVERAGE FLOW DEPTH(FEET) =   0.26   FLOOD WIDTH(FEET) =   11.32
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    8.23
  SUBAREA AREA(ACRES) =    1.08       SUBAREA RUNOFF(CFS) =    4.68
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.791
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       4.89

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOOD WIDTH(FEET) =   17.41
  FLOW VELOCITY(FEET/SEC.) =   2.55   DEPTH*VELOCITY(FT*FT/SEC) =   0.81
  LONGEST FLOWPATH FROM NODE    118.00 TO NODE    116.00 =     394.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.23
  RAINFALL INTENSITY(INCH/HR) =   5.16
  TOTAL STREAM AREA(ACRES) =     1.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.89

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.03     6.86        5.801          1.54
      2        4.89     8.23        5.156          1.20

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.11     6.86       5.801
      2       10.25     8.23       5.156

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.25   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        2.7
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     462.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    99.90  DOWNSTREAM(FEET) =    98.70
  FLOW LENGTH(FEET) =    86.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.25
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.42
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    122.00 =     548.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.082
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7312
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.41
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =      10.52
  TC(MIN.) =    8.42

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    98.70  DOWNSTREAM(FEET) =    97.90
  FLOW LENGTH(FEET) =    54.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.90
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.52
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    8.53
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    106.00 =     602.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       10.52     8.53       5.039        2.83
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    106.00 =     602.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.44    23.37       2.631        5.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     913.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      12.87       8.53        5.039
      2      11.94      23.37        2.631

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.87   Tc(MIN.) =    8.53
  TOTAL AREA(ACRES) =        8.1

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    124.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.90  DOWNSTREAM(FEET) =    74.90
  FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.96
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.87
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.66
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    1068.00 FEET.

+--------------------------------------------------------------------------+
```

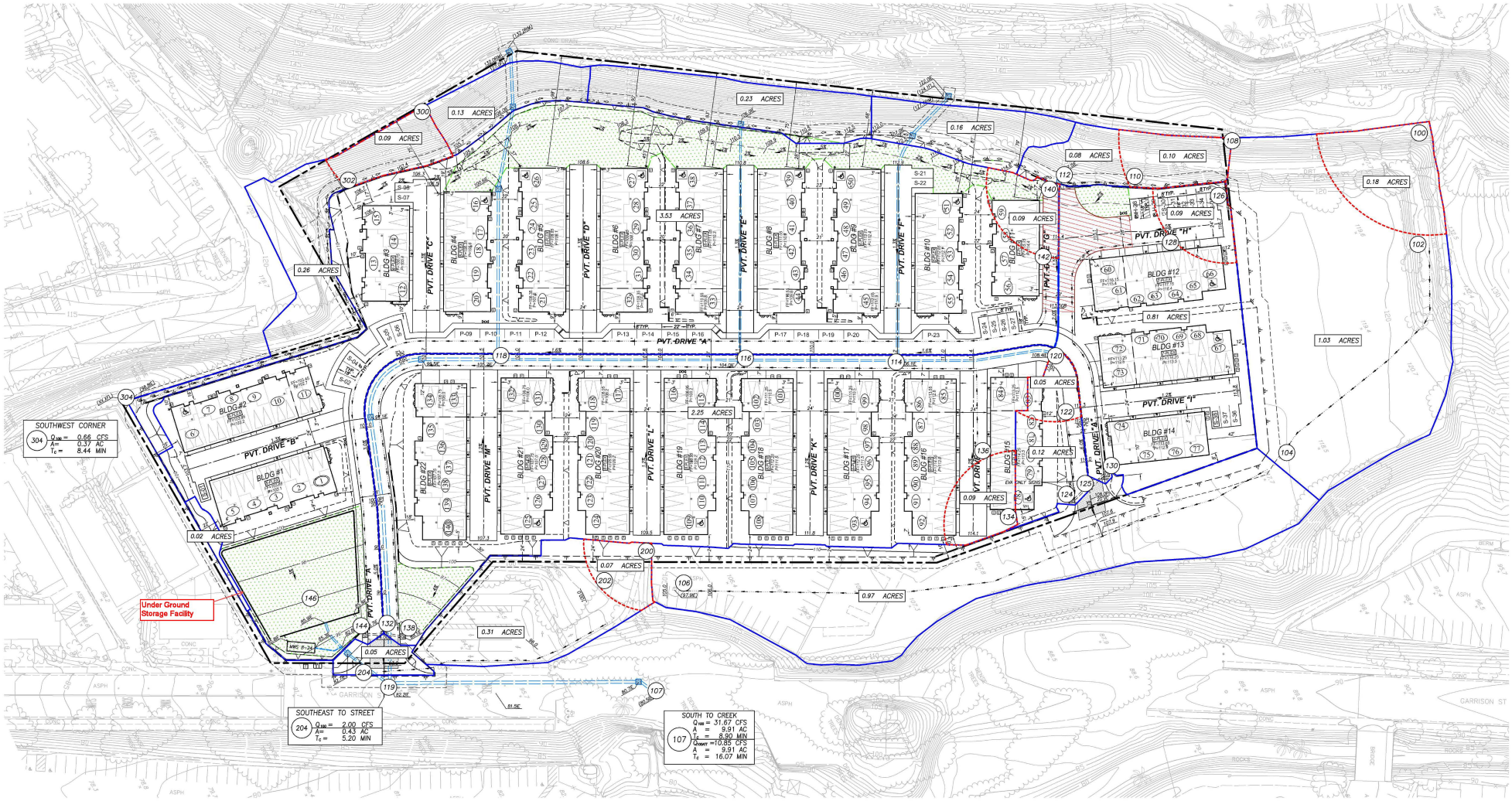
```
| BEGIN SOUTHEAST WATERSHED ANALYSIS                                    |
|                                                                       |
|                                                                       |
+-----------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    107.40
  DOWNSTREAM ELEVATION(FEET) =    106.00
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.102
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  106.00  DOWNSTREAM ELEVATION(FEET) =   92.00
  STREET LENGTH(FEET) =   418.50   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 13.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.83
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.05
  STREET FLOW TRAVEL TIME(MIN.) =   1.91   Tc(MIN.) =    4.01
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7200
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.729
  SUBAREA AREA(ACRES) =    0.98      SUBAREA RUNOFF(CFS) =    5.02
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       5.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.64
  FLOW VELOCITY(FEET/SEC.) =  4.27   DEPTH*VELOCITY(FT*FT/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     478.50 FEET.

+-----------------------------------------------------------------------+
| BEGIN WEST WATERSHED ANALYSIS                                         |
|                                                                       |
|                                                                       |
+-----------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .4600
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    136.00
  DOWNSTREAM ELEVATION(FEET) =    109.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.348
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.812
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    109.00  DOWNSTREAM(FEET) =    107.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   144.00   CHANNEL SLOPE =  0.0083
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.795
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (4.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.58
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.52
  Tc(MIN.) =    6.87
  SUBAREA AREA(ACRES) =     0.48       SUBAREA RUNOFF(CFS) =    1.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.488
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.92

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   1.78
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     244.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.795
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5430
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.78
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.71
  TC(MIN.) =    6.87

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    310.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   104.40  DOWNSTREAM(FEET) =   101.60
  FLOW LENGTH(FEET) =   189.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.63
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.71
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =    7.43
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    310.00 =     433.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.43
  RAINFALL INTENSITY(INCH/HR) =   5.51
  TOTAL STREAM AREA(ACRES) =     0.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.71

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    308.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    120.40
  DOWNSTREAM ELEVATION(FEET) =    107.00
  ELEVATION DIFFERENCE(FEET) =     13.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.605
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.609
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    310.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =    105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.487
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.89
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.87
  Tc(MIN.) =    7.48
  SUBAREA AREA(ACRES) =     0.48       SUBAREA RUNOFF(CFS) =    1.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.573
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    310.00 =     180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    310.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.48
  RAINFALL INTENSITY(INCH/HR) =   5.49
  TOTAL STREAM AREA(ACRES) =     0.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.76

  ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.71     7.43        5.510          0.86
      2        1.76     7.48        5.487          0.56

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.45     7.43       5.510
      2        4.46     7.48       5.487

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.46   Tc(MIN.) =    7.48
  TOTAL AREA(ACRES) =        1.4
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    310.00 =     433.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    312.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   101.60  DOWNSTREAM(FEET) =    95.60
  FLOW LENGTH(FEET) =    41.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.71
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.46
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.53
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    312.00 =     474.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    312.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.465
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5401
  SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.21
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       4.52
  TC(MIN.) =    7.53
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.5  TC(MIN.) =      7.53
  PEAK FLOW RATE(CFS)   =       4.52
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED CONDITION



LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- 00.00 ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- 406 — NODE NUMBER
- EXISTING HARDSCAPE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN

40 0 40 80 120
SCALE 1"= 40'

PREPARED BY:		MAP
HUNSAKER & ASSOCIATES SAN DIEGO, INC PLANNING 9707 Waples Street ENGINEERING San Diego, Ca 92121 SURVEYING PH(858)558-4500- FX(858)558-1414	PROPOSED DRAINAGE MAP GARRISON ELEMENTARY SCHOOL CITY OF OCEANSIDE, CALIFORNIA	2 OF 2

R.O.# 3214-0002

R:\1778\Hyd\DR\CAD\1778-Hydro-PR.dwg[]Apr-14-2025:16:59

AES PR INPUT DATA															
Node #		Code	Elevation		Length	Slope	Area		Imperviousness	Assumed	C value	If Channel			If memory
From	To		Up	Down			Total	Land Use / Imp Area		Soil Type		Base (ft)	Z:1	manning	Bank #
100	102	2	139	128.4	100	11%	0.18	0.00	0%	D	0.35				
102	104	5	128.4	117.8	266	4.0%	1.03	0.00	0%	D	0.35	200	50	0.03	
104	106	5	117.8	105	551	2.3%	0.97	0.26	27%	D	0.50	10	50	0.03	
106	107	3	97.9	80.5	96	18%									
107	107	10													1
108	110	2	138	117	100	21%	0.10	0.00	0%	D	0.35				
110	112	5	117	113	61	6.6%	0.08	0.00	0%	D	0.35	3	2	0.015	
112	114	3	102.83	97.03	290	2.0%									
114	114	8					0.16	0.00	0%	D	0.35				
114	116	3	97.03	94.93	140	1.5%									
116	116	8					0.23	0.00	0%	D	0.35				
116	118	3	94.93	91.7	215	1.5%									
118	118	8					0.13	0.00	0%	D	0.35				
118	119	3	91.7	82.2	380	2.5%									
119	119	10													2
120	122	2	113.5	112.2	65	2.0%	0.05	HDR 43DU/A	80%	D	0.79				
122	124	6	112.2	108.2	70	5.7%	0.12	HDR 43DU/A	80%	D	0.79				
124	125	3	105.2	105	12	1.7%									
125	125	1													1-2
126	128	2	117	116	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
128	130	6	116	109	280	2.5%	0.81	HDR 43DU/A	80%	D	0.79				
130	125	3	106	105	12	8.3%									
125	125	1													2-2
125	132	3	105	88.9	965	1.7%									
132	132	1													1-2
134	136	2	114.1	113.4	65	1.1%	0.09	HDR 43DU/A	80%	D	0.79				
136	138	6	113.4	95	830	2.2%	2.25	HDR 43DU/A	80%	D	0.79				
138	132	3	89.1	88.9	12	1.7%									
132	132	1													2-2
132	144	3	88.9	88.7	12	1.7%									
144	144	1													1-2
140	142	2	115.1	114.1	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
142	144	6	114.1	95	910	2.1%	3.53	HDR 43DU/A	80%	D	0.79				
144	144	1													2-2
144	146	3	88.7	88.45	22	1.1%									
146	119	3	83.45	82.2	81	1.5%									
119	119	11													2
119	119	12													2
119	107	3	82.2	80.5	230	0.7%									
107	107	11													1
107	107	12													1
					South Watershed		9.91								
200	202	2	109.5	101	65	13%	0.07	0.02	29%	D	0.51				
202	204	6	101	94	219	3.2%	0.31	0.19	61%	D	0.69				
204	204	8					0.05	0.04	76%	D	0.77				
					Southwest Watershed		0.43								
300	302	2	135	110	100	25%	0.09	0.00	0%	D	0.35				
302	304	5	110	94	357	4.5%	0.26	0.00	0%	D	0.35	3	2	0.015	
302	304	8					0.02	0.00	0%	D	0.35				
					West Watershed		0.37								

Runoff calculation example (typ):
0.9 X (0.30)+0.35 X (1-0.30)= 0.52
(0.9X Imp%) +(0.35X Per%)

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                           Analysis prepared by:

                    Hunsaker & Associates San Diego, Inc.
                              9707 Waples Street
                             San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* GARRISON ELEMENTARY SCHOOL                                             *
* PROPOSED CONDITIONS - 100- YEAR                                        *
* DLN 1778, W.O. 3214-0002                                               *
 ************************************************************************

  FILE NAME: R:\1778\HYD\DR\CALCS\AES\100PR.DAT
  TIME/DATE OF STUDY: 17:04 10/18/2024
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   10.5      5.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   12.5      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    139.00
  DOWNSTREAM ELEVATION(FEET) =    128.40
  ELEVATION DIFFERENCE(FEET) =     10.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    128.40  DOWNSTREAM(FEET) =    117.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0398
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.491
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.50
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   8.81
  Tc(MIN.) =   15.08
  SUBAREA AREA(ACRES) =     1.03       SUBAREA RUNOFF(CFS) =    1.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       1.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.01   FLOW VELOCITY(FEET/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     366.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.80  DOWNSTREAM(FEET) =    105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   551.00   CHANNEL SLOPE =  0.0232
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.748
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   6.77
  Tc(MIN.) =   21.84
  SUBAREA AREA(ACRES) =     0.97       SUBAREA RUNOFF(CFS) =    1.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.417
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =       2.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     917.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.90  DOWNSTREAM(FEET) =    80.50
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   21.96
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    138.00
  DOWNSTREAM ELEVATION(FEET) =    117.00
  ELEVATION DIFFERENCE(FEET) =     21.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.00  DOWNSTREAM(FEET) =    113.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    61.00   CHANNEL SLOPE =  0.0656
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.927
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =    6.64
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   2.95
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   102.83  DOWNSTREAM(FEET) =    97.03
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   1.37    Tc(MIN.) =    8.01
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    114.00 =     451.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.250
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.29
```

```
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.62
  TC(MIN.) =    8.01

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.03  DOWNSTREAM(FEET) =    94.93
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.62
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    8.64
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.999
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.40
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.00
  TC(MIN.) =    8.64

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    94.93  DOWNSTREAM(FEET) =    91.70
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.00
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    118.00 =     806.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.707
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.21
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.15
  TC(MIN.) =    9.49

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.70  DOWNSTREAM(FEET) =    82.20
  FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.15
  PIPE TRAVEL TIME(MIN.) =   1.19    Tc(MIN.) =   10.68
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    113.50
  DOWNSTREAM ELEVATION(FEET) =    112.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  112.20  DOWNSTREAM ELEVATION(FEET) =  108.20
  STREET LENGTH(FEET) =    70.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   0.26   Tc(MIN.) =    4.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.65
  FLOW VELOCITY(FEET/SEC.) =  3.80   DEPTH*VELOCITY(FT*FT/SEC.) =   0.76
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     135.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.20  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.96
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.20
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =     147.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.20
  RAINFALL INTENSITY(INCH/HR) =   7.11
  TOTAL STREAM AREA(ACRES) =     0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    117.00
  DOWNSTREAM ELEVATION(FEET) =    116.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  116.00  DOWNSTREAM ELEVATION(FEET) =  109.00
  STREET LENGTH(FEET) =   280.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.26
```

```
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.96
  STREET FLOW TRAVEL TIME(MIN.) =   1.43   Tc(MIN.) =    5.33
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.827
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    4.37
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.86
  FLOW VELOCITY(FEET/SEC.) =  3.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    130.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.00  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.85
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.35
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.35
  RAINFALL INTENSITY(INCH/HR) =   6.81
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.96     4.20        7.114          0.17
      2        4.85     5.35        6.813          0.90

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.77     4.20       7.114
      2        5.77     5.35       6.813

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.77   Tc(MIN.) =    5.35
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.00  DOWNSTREAM(FEET) =    88.90
```

```
  FLOW LENGTH(FEET) =   965.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   2.23    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.57
  RAINFALL INTENSITY(INCH/HR) =   5.44
  TOTAL STREAM AREA(ACRES) =     1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    114.10
  DOWNSTREAM ELEVATION(FEET) =    113.40
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.389
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    138.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  113.40  DOWNSTREAM ELEVATION(FEET) =   95.00
  STREET LENGTH(FEET) =   830.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   3.81   Tc(MIN.) =    8.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.169
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    2.25      SUBAREA RUNOFF(CFS) =    9.19
```

```
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.50
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.43
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    138.00 =     895.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    89.10  DOWNSTREAM(FEET) =    88.90
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.56
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.23
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    132.00 =     907.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.23
  RAINFALL INTENSITY(INCH/HR) =   5.16
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.56

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.77     7.57        5.443          1.07
      2        9.56     8.23        5.159          2.34

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       14.56     7.57       5.443
      2       15.02     8.23       5.159

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.02   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    144.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    88.90  DOWNSTREAM(FEET) =    88.70
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.10
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.02
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.25
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.25
  RAINFALL INTENSITY(INCH/HR) =   5.15
  TOTAL STREAM AREA(ACRES) =     3.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.02

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    115.10
  DOWNSTREAM ELEVATION(FEET) =    114.10
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    144.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  114.10  DOWNSTREAM ELEVATION(FEET) =   95.00
  STREET LENGTH(FEET) =   910.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.82
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.38   FLOOD WIDTH(FEET) =   12.50
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.69
    SPLIT DEPTH(FEET) =    0.26   SPLIT FLOOD WIDTH(FEET) =    6.92
    SPLIT FLOW(CFS) =    1.63   SPLIT VELOCITY(FEET/SEC.) =    2.73
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.38
    HALFSTREET FLOOD WIDTH(FEET) =   12.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.39
  STREET FLOW TRAVEL TIME(MIN.) =   4.12   Tc(MIN.) =    8.01
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.248
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    3.53      SUBAREA RUNOFF(CFS) =   14.64
  TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      15.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.50
  FLOW VELOCITY(FEET/SEC.) =  3.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
```

```
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    144.00 =     975.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.01
  RAINFALL INTENSITY(INCH/HR) =   5.25
  TOTAL STREAM AREA(ACRES) =     3.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.01

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       15.02     8.25        5.150          3.41
      2       15.01     8.01        5.248          3.62

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       29.75     8.01       5.248
      2       29.75     8.25       5.150

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.75   Tc(MIN.) =    8.25
  TOTAL AREA(ACRES) =        7.0
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    146.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    88.70  DOWNSTREAM(FEET) =    88.45
  FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.19
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.75
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.29
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    146.00 =    1356.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    83.45  DOWNSTREAM(FEET) =    82.20
  FLOW LENGTH(FEET) =    81.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.46
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.75
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.42
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

```
  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       29.75     8.42       5.083        7.03
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.15    10.68       4.360        0.70
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      30.66       8.42        5.083
      2      26.67      10.68        4.360

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      30.66   Tc(MIN.) =    8.42
  TOTAL AREA(ACRES) =        7.7

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.20  DOWNSTREAM(FEET) =    80.50
  FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.91
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      30.66
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    8.90
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       30.66     8.90       4.903        7.73
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.50    21.96       2.739        2.18
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      31.67       8.90        4.903
      2      19.62      21.96        2.739

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      31.67   Tc(MIN.) =    8.90
  TOTAL AREA(ACRES) =        9.9
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    109.50
  DOWNSTREAM ELEVATION(FEET) =    101.00
  ELEVATION DIFFERENCE(FEET) =      8.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.974
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  101.00  DOWNSTREAM ELEVATION(FEET) =   94.00
  STREET LENGTH(FEET) =   219.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 10.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.50
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =    5.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.657
  SUBAREA AREA(ACRES) =    0.31      SUBAREA RUNOFF(CFS) =    1.48
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.42
  FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   0.83
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     284.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
```

```
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6700
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       2.00
  TC(MIN.) =    5.20

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    135.00
  DOWNSTREAM ELEVATION(FEET) =    110.00
  ELEVATION DIFFERENCE(FEET) =     25.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    110.00  DOWNSTREAM(FEET) =     94.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   357.00   CHANNEL SLOPE =  0.0448
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.73
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.18
  Tc(MIN.) =    8.44
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   3.11
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     457.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.04
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.66
  TC(MIN.) =    8.44
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      8.44
  PEAK FLOW RATE(CFS)   =       0.66
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

AES PR-MITIGATED INPUT DATA															
Node #		Code	Elevation		Length	Slope	Area		Imperviousness	Assumed	C value	If Channel			If memory
From	To		Up	Down			Total	Land Use / Imp Area		Soil Type		Base (ft)	Z:1	manning	Bank #
100	102	2	139	128.4	100	11%	0.18	0.00	0%	D	0.35				
102	104	5	128.4	117.8	266	4.0%	1.03	0.00	0%	D	0.35	200	50	0.03	
104	106	5	117.8	105	551	2.3%	0.97	0.26	27%	D	0.50	10	50	0.03	
106	107	3	97.9	80.5	96	18%									
107	107	10													1
108	110	2	138	117	100	21%	0.10	0.00	0%	D	0.35				
110	112	5	117	113	61	6.6%	0.08	0.00	0%	D	0.35	3	2	0.015	
112	114	3	102.83	97.03	290	2.0%									
114	114	8					0.16	0.00	0%	D	0.35				
114	116	3	97.03	94.93	140	1.5%									
116	116	8					0.23	0.00	0%	D	0.35				
116	118	3	94.93	91.7	215	1.5%									
118	118	8					0.13	0.00	0%	D	0.35				
118	119	3	91.7	82.2	380	2.5%									
119	119	10													2
120	122	2	113.5	112.2	65	2.0%	0.05	HDR 43DU/A	80%	D	0.79				
122	124	6	112.2	108.2	70	5.7%	0.12	HDR 43DU/A	80%	D	0.79				
124	125	3	105.2	105	12	1.7%									
125	125	1													1-2
126	128	2	117	116	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
128	130	6	116	109	280	2.5%	0.81	HDR 43DU/A	80%	D	0.79				
130	125	3	106	105	12	8.3%									
125	125	1													2-2
125	132	3	105	88.9	965	1.7%									
132	132	1													1-2
134	136	2	114.1	113.4	65	1.1%	0.09	HDR 43DU/A	80%	D	0.79				
136	138	6	113.4	95	830	2.2%	2.25	HDR 43DU/A	80%	D	0.79				
138	132	3	89.1	88.9	12	1.7%									
132	132	1													2-2
132	144	3	88.9	88.7	12	1.7%									
144	144	1													1-2
140	142	2	115.1	114.1	65	1.5%	0.09	HDR 43DU/A	80%	D	0.79				
142	144	6	114.1	95	910	2.1%	3.53	HDR 43DU/A	80%	D	0.79				
144	144	1													2-2
144	146	3	88.7	88.45	22	1.1%									
			Q (CFS)		A (AC)		TC (MIN)								
146	146	7	8.11		7.03		=8.25+7								
146	119	3	83.45	82.2	81	1.5%									
119	119	11													2
119	119	12													2
119	107	3	82.2	80.5	230	0.7%									
107	107	11													1
107	107	12													1
					South Watershed		9.91								
200	202	2	109.5	101	65	13%	0.07	0.02	29%	D	0.51				
202	204	6	101	94	219	3.2%	0.31	0.19	61%	D	0.69				
204	204	8					0.05	0.04	76%	D	0.77				
					Southwest Watershed		0.43								
300	302	2	135	110	100	25%	0.09	0.00	0%	D	0.35				
302	304	5	110	94	357	4.5%	0.26	0.00	0%	D	0.35	3	2	0.015	
302	304	8					0.02	0.00	0%	D	0.35				
					West Watershed		0.37								

Runoff calculation example (typ):
0.9 X (0.30)+0.35 X (1-0.30)= 0.52
(0.9X Imp%) +(0.35X Per%)

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                           Analysis prepared by:

                    Hunsaker & Associates San Diego, Inc.
                              9707 Waples Street
                             San Diego,  CA 92121


 ************************* DESCRIPTION OF STUDY *************************
* GARRISON ELEMENTARY SCHOOL                                             *
* PROPOSED CONDITIONS - 100-YEAR MITIGATED                               *
* DLN 1778, W.O. 3214-0002                                               *
 ************************************************************************

  FILE NAME: R:\1778\HYD\DR\CALCS\AES\100PRMIT.DAT
  TIME/DATE OF STUDY: 09:02 11/04/2024
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   10.5      5.5    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   12.5      6.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    139.00
  DOWNSTREAM ELEVATION(FEET) =    128.40
  ELEVATION DIFFERENCE(FEET) =     10.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    128.40  DOWNSTREAM(FEET) =    117.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0398
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.491
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.50
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   8.81
  Tc(MIN.) =   15.08
  SUBAREA AREA(ACRES) =     1.03       SUBAREA RUNOFF(CFS) =    1.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       1.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.01   FLOW VELOCITY(FEET/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     366.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.80  DOWNSTREAM(FEET) =    105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   551.00   CHANNEL SLOPE =  0.0232
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.748
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   6.77
  Tc(MIN.) =   21.84
  SUBAREA AREA(ACRES) =     0.97       SUBAREA RUNOFF(CFS) =    1.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.417
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =       2.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     917.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.90  DOWNSTREAM(FEET) =    80.50
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   21.96
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
================================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    138.00
  DOWNSTREAM ELEVATION(FEET) =    117.00
  ELEVATION DIFFERENCE(FEET) =     21.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    117.00  DOWNSTREAM(FEET) =    113.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    61.00   CHANNEL SLOPE =  0.0656
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.927
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =    6.64
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   2.95
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    112.00 =     161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   102.83  DOWNSTREAM(FEET) =    97.03
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   1.37    Tc(MIN.) =    8.01
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    114.00 =     451.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.250
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.29
```

```
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.62
  TC(MIN.) =    8.01

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    97.03  DOWNSTREAM(FEET) =    94.93
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.62
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =    8.64
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    116.00 =     591.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.999
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    0.40
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.00
  TC(MIN.) =    8.64

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    94.93  DOWNSTREAM(FEET) =    91.70
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.00
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    118.00 =     806.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.707
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.21
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.15
  TC(MIN.) =    9.49

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    91.70  DOWNSTREAM(FEET) =    82.20
  FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.15
  PIPE TRAVEL TIME(MIN.) =   1.19    Tc(MIN.) =   10.68
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    113.50
  DOWNSTREAM ELEVATION(FEET) =    112.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  112.20  DOWNSTREAM ELEVATION(FEET) =  108.20
  STREET LENGTH(FEET) =    70.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   0.26   Tc(MIN.) =    4.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.65
  FLOW VELOCITY(FEET/SEC.) =  3.80   DEPTH*VELOCITY(FT*FT/SEC.) =   0.76
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =     135.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.20  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.96
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.20
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =     147.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.20
  RAINFALL INTENSITY(INCH/HR) =   7.11
  TOTAL STREAM AREA(ACRES) =     0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    117.00
  DOWNSTREAM ELEVATION(FEET) =    116.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  116.00  DOWNSTREAM ELEVATION(FEET) =  109.00
  STREET LENGTH(FEET) =   280.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.26
```

```
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.96
  STREET FLOW TRAVEL TIME(MIN.) =   1.43   Tc(MIN.) =    5.33
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.827
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    4.37
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       4.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.86
  FLOW VELOCITY(FEET/SEC.) =  3.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    130.00 =     345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   106.00  DOWNSTREAM(FEET) =   105.00
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.85
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.35
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.35
  RAINFALL INTENSITY(INCH/HR) =   6.81
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.96     4.20        7.114          0.17
      2        4.85     5.35        6.813          0.90

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.77     4.20       7.114
      2        5.77     5.35       6.813

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.77   Tc(MIN.) =    5.35
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    125.00 =     357.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   105.00  DOWNSTREAM(FEET) =    88.90
```

```
  FLOW LENGTH(FEET) =   965.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   2.23    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.57
  RAINFALL INTENSITY(INCH/HR) =   5.44
  TOTAL STREAM AREA(ACRES) =     1.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    114.10
  DOWNSTREAM ELEVATION(FEET) =    113.40
  ELEVATION DIFFERENCE(FEET) =      0.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.389
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    138.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  113.40  DOWNSTREAM ELEVATION(FEET) =   95.00
  STREET LENGTH(FEET) =   830.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.29
  STREET FLOW TRAVEL TIME(MIN.) =   3.81   Tc(MIN.) =    8.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.169
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    2.25      SUBAREA RUNOFF(CFS) =    9.19
```

```
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.50
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.43
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    138.00 =     895.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    89.10  DOWNSTREAM(FEET) =    88.90
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.56
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.23
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    132.00 =     907.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.23
  RAINFALL INTENSITY(INCH/HR) =   5.16
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.56

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.77     7.57        5.443          1.07
      2        9.56     8.23        5.159          2.34

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       14.56     7.57       5.443
      2       15.02     8.23       5.159

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.02   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    132.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    144.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    88.90  DOWNSTREAM(FEET) =    88.70
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.10
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.02
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.25
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.25
  RAINFALL INTENSITY(INCH/HR) =   5.15
  TOTAL STREAM AREA(ACRES) =     3.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.02

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    115.10
  DOWNSTREAM ELEVATION(FEET) =    114.10
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.897
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    144.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  114.10  DOWNSTREAM ELEVATION(FEET) =   95.00
  STREET LENGTH(FEET) =   910.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.82
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.38   FLOOD WIDTH(FEET) =   12.50
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.69
    SPLIT DEPTH(FEET) =    0.26   SPLIT FLOOD WIDTH(FEET) =    6.92
    SPLIT FLOW(CFS) =    1.63   SPLIT VELOCITY(FEET/SEC.) =    2.73
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.38
    HALFSTREET FLOOD WIDTH(FEET) =   12.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.39
  STREET FLOW TRAVEL TIME(MIN.) =   4.12   Tc(MIN.) =    8.01
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.248
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    3.53      SUBAREA RUNOFF(CFS) =   14.64
  TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      15.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.50
  FLOW VELOCITY(FEET/SEC.) =  3.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
```

```
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    144.00 =     975.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    144.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.01
  RAINFALL INTENSITY(INCH/HR) =   5.25
  TOTAL STREAM AREA(ACRES) =     3.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.01

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       15.02     8.25        5.150          3.41
      2       15.01     8.01        5.248          3.62

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       29.75     8.01       5.248
      2       29.75     8.25       5.150

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.75   Tc(MIN.) =    8.25
  TOTAL AREA(ACRES) =        7.0
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    144.00 =    1334.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    146.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    88.70  DOWNSTREAM(FEET) =    88.45
  FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.19
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.75
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.29
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    146.00 =    1356.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    146.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  15.25   RAIN INTENSITY(INCH/HOUR) =  3.47
  TOTAL AREA(ACRES) =     7.03   TOTAL RUNOFF(CFS) =      8.11

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    83.45  DOWNSTREAM(FEET) =    82.20
  FLOW LENGTH(FEET) =    81.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.63
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.11
```

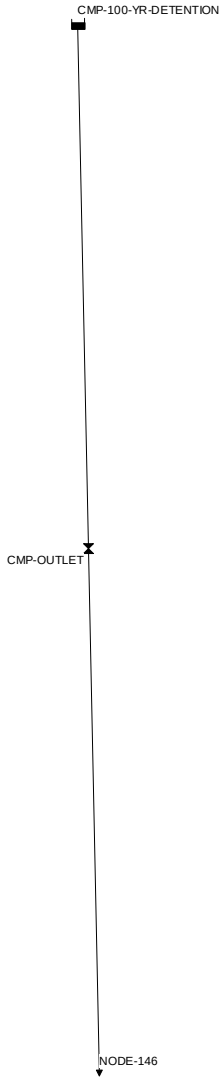
```
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =   15.43
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        8.11    15.43       3.440        7.03
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    119.00 =    1437.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.15    10.68       4.360        0.70
  LONGEST FLOWPATH FROM NODE    108.00 TO NODE    119.00 =    1186.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       6.77      10.68        4.360
      2       9.02      15.43        3.440

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.02   Tc(MIN.) =   15.43
  TOTAL AREA(ACRES) =        7.7

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    119.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    82.20  DOWNSTREAM(FEET) =    80.50
  FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.93
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.02
  PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   16.07
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        9.02    16.07       3.350        7.73
  LONGEST FLOWPATH FROM NODE    126.00 TO NODE    107.00 =    1667.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.50    21.96       2.739        2.18
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1013.00 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      10.85      16.07        3.350
      2       9.87      21.96        2.739

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.85   Tc(MIN.) =   16.07
  TOTAL AREA(ACRES) =        9.9

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (7.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    109.50
  DOWNSTREAM ELEVATION(FEET) =    101.00
  ELEVATION DIFFERENCE(FEET) =      8.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.974
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  101.00  DOWNSTREAM ELEVATION(FEET) =   94.00
  STREET LENGTH(FEET) =   219.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 10.50

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.50
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =    5.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.657
  SUBAREA AREA(ACRES) =    0.31      SUBAREA RUNOFF(CFS) =    1.48
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.42
  FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   0.83
```

```
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     284.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.934
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6700
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       2.00
  TC(MIN.) =    5.20

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    135.00
  DOWNSTREAM ELEVATION(FEET) =    110.00
  ELEVATION DIFFERENCE(FEET) =     25.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    110.00  DOWNSTREAM(FEET) =     94.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   357.00   CHANNEL SLOPE =  0.0448
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.73
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   2.18
  Tc(MIN.) =    8.44
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   3.11
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     457.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.04
```

```
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.66
  TC(MIN.) =    8.44
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      8.44
  PEAK FLOW RATE(CFS)   =       0.66
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 6 –Detention Calculations


CMP-100-YR-DETENTION
CMP-OUTLET
NODE-146

Rational Method Hydrograph Calculations
for
Garrison Elementary School, City of Oceanside, CA

		Q_{10}=	29.75	cfs				
		Tc=	8	min	C=	0.79		
#=	45	$P_{10,6}$=	2.7	in	A=	7.03	acres	
		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
#	**D (MIN)**	**I (IN/HR)**	**VOL (IN)**	**ΔVOL (IN)**	**I (INCR) (IN/HR)**	**Q (CFS)**	**VOL (CF)**	**ORDINATE (CFS)**
0	0	0.00	0.00	0.70	5.25	29.75	14280	0.00
1	8	5.25	0.70	0.20	1.47	8.14	3907	0.90
2	16	3.36	0.90	0.14	1.04	5.78	2773	0.91
3	24	2.59	1.03	0.11	0.83	4.63	2224	0.94
4	32	2.15	1.15	0.09	0.71	3.93	1889	0.95
5	40	1.86	1.24	0.08	0.62	3.45	1658	0.98
6	48	1.65	1.32	0.07	0.56	3.10	1488	1.00
7	56	1.50	1.40	0.07	0.51	2.83	1357	1.04
8	64	1.37	1.47	0.06	0.47	2.61	1251	1.06
9	72	1.27	1.53	0.06	0.44	2.43	1164	1.10
10	80	1.19	1.59	0.05	0.41	2.27	1091	1.12
11	88	1.12	1.64	0.05	0.39	2.14	1029	1.17
12	96	1.06	1.69	0.05	0.37	2.03	975	1.19
13	104	1.00	1.74	0.05	0.35	1.93	928	1.25
14	112	0.96	1.79	0.04	0.33	1.85	886	1.28
15	120	0.92	1.83	0.04	0.32	1.77	849	1.35
16	128	0.88	1.87	0.04	0.31	1.70	815	1.39
17	136	0.84	1.92	0.04	0.29	1.64	785	1.48
18	144	0.81	1.95	0.04	0.28	1.58	757	1.52
19	152	0.79	1.99	0.04	0.27	1.52	732	1.64
20	160	0.76	2.03	0.04	0.27	1.48	709	1.70
21	168	0.74	2.06	0.03	0.26	1.43	687	1.85
22	176	0.72	2.10	0.03	0.25	1.39	667	1.93
23	184	0.70	2.13	0.03	0.24	1.35	649	2.14
24	192	0.68	2.16	0.03	0.24	1.32	632	2.27
25	200	0.66	2.20	0.03	0.23	1.28	616	2.61
26	208	0.64	2.23	0.03	0.23	1.25	601	2.83
27	216	0.63	2.26	0.03	0.22	1.22	586	3.45
28	224	0.61	2.29	0.03	0.21	1.19	573	3.93
29	232	0.60	2.31	0.03	0.21	1.17	560	5.78
30	240	0.59	2.34	0.03	0.21	1.14	548	8.14
31	248	0.57	2.37	0.03	0.20	1.12	537	29.75
32	256	0.56	2.40	0.03	0.20	1.10	526	4.63
33	264	0.55	2.42	0.03	0.19	1.08	516	3.10
34	272	0.54	2.45	0.03	0.19	1.06	507	2.43
35	280	0.53	2.47	0.02	0.19	1.04	497	2.03
36	288	0.52	2.50	0.02	0.18	1.02	488	1.77
37	296	0.51	2.52	0.02	0.18	1.00	480	1.58
38	304	0.50	2.55	0.02	0.18	0.98	472	1.43
39	312	0.49	2.57	0.02	0.17	0.97	464	1.32
40	320	0.49	2.59	0.02	0.17	0.95	457	1.22
41	328	0.48	2.62	0.02	0.17	0.94	450	1.14
42	336	0.47	2.64	0.02	0.17	0.92	443	1.08
43	344	0.46	2.66	0.02	0.16	0.91	436	1.02
44	352	0.46	2.68	0.02	0.16	0.90	430	0.97
45	360	0.45	2.71	0.00	0.00	0.00	0	0.92
						SUM=	**54371**	**cubic feet**
							1.25	**acre-feet**

Check: $V = C*A*P_6$

V= 1.25 acre-feet

OK

CMP #1 Stage Storage					
Input DCV			11,849		
Input Factor			1.5		
Factor X DCV			17,773.5		
WQ Ponding Depth			2.750	ft	
Note: Find out the elevation value in relation to required WQ volume					
HMP-1					
depth	area	area (ac)	elevation	volume (cf)	volume (acft)
0.00	3634.0	0.0834	0.00	0.0	0.00000
0.17	4818.6	0.1106	0.17	737.9	0.01694
0.33	5288.7	0.1214	0.33	1,582.7	0.03633
0.50	5635.1	0.1294	0.50	2,494.2	0.05726
0.67	5914.8	0.1358	0.67	3,457.4	0.07937
0.83	6150.3	0.1412	0.83	4,463.3	0.10246
1.00	6352.9	0.1458	1.00	5,505.7	0.12639
1.17	6529.7	0.1499	1.17	6,579.6	0.15105
1.33	6685.1	0.1535	1.33	7,681.1	0.17633
1.50	6822.2	0.1566	1.50	8,806.9	0.20218
1.67	6943.4	0.1594	1.67	9,954.3	0.22852
1.83	7050.2	0.1619	1.83	11,120.6	0.25529
2.00	7144.1	0.1640	2.00	12,303.6	0.28245
2.17	7226.1	0.1659	2.17	13,501.3	0.30995
2.33	7296.8	0.1675	2.33	14,711.7	0.33773
2.50	7357.1	0.1689	2.50	15,933.0	0.36577
2.67	7407.3	0.1700	2.67	17,163.5	0.39402
2.75	7427.6	0.1705	2.75	17782.5	0.40823
2.83	7447.9	0.1710	2.83	18,401.5	0.42244
3.00	7479.2	0.1717	3.00	19,645.6	0.45100
3.17	7501.3	0.1722	3.17	20,894.1	0.47966
3.33	7514.6	0.1725	3.33	22,145.5	0.50839
3.50	7519.0	0.1726	3.50	23,398.5	0.53715
3.67	7514.6	0.1725	3.67	24,651.4	0.56592
3.83	7501.3	0.1722	3.83	25,902.8	0.59465
4.00	7479.2	0.1717	4.00	27,151.3	0.62331
4.17	7447.9	0.1710	4.17	28,395.4	0.65187
4.33	7407.3	0.1700	4.33	29,633.4	0.68029
4.50	7357.1	0.1689	4.50	30,863.9	0.70854
4.67	7296.8	0.1675	4.67	32,085.2	0.73658
4.83	7226.1	0.1659	4.83	33,295.6	0.76436
5.00	7144.1	0.1640	5.00	34,493.3	0.79186
5.17	7050.2	0.1619	5.17	35,676.3	0.81902
5.33	6943.4	0.1594	5.33	36,842.6	0.84579
5.50	6822.2	0.1566	5.50	37,990.0	0.87213
5.67	6685.1	0.1535	5.67	39,115.8	0.89798
5.83	6529.7	0.1499	5.83	40,217.3	0.92326
6.00	6352.9	0.1458	6.00	41,291.2	0.94792
6.17	6150.3	0.1412	6.17	42,333.6	0.97184
6.33	5914.8	0.1358	6.33	43,339.5	0.99494
6.50	5635.1	0.1294	6.50	44,302.7	1.01705
6.67	5288.7	0.1214	6.67	45,214.2	1.03798
6.83	4818.6	0.1106	6.83	46,059.0	1.05737
7.00	3634.0	0.0834	7.00	46,796.9	1.07431
7.17	3634.0	0.0834	7.17	47,402.6	1.08821
7.33	3634.0	0.0834	7.33	48,008.2	1.10212
7.50	3634.0	0.0834	7.50	48,613.9	1.11602

CMP-1 Discharge to MWS BF-3-1

Discharge vs Elevation Table

Low orifice:	2.5 "	Top orifice:	0.625 "
Number:	1	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.00 ft	invert elev:	0.40 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.80	0.00	0.00	0.042	0.035	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	1.60	0.00	0.00	0.080	0.100	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	2.40	0.00	1.92	0.105	0.136	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	3.20	2.42	5.12	0.125	0.142	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	4.00	4.85	8.32	0.142	0.234	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	4.80	7.27	11.52	0.158	0.708	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	5.60	9.70	14.72	0.172	2.103	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	6.40	12.12	17.92	0.185	5.265	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	7.20	14.55	21.12	0.197	11.405	0.197	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	8.00	16.97	24.32	0.209	22.164	0.209	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	8.80	19.39	27.52	0.219	39.678	0.219	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	9.60	21.82	30.72	0.230	66.635	0.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	10.40	24.24	33.92	0.240	106.340	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	11.20	26.67	37.12	0.249	162.779	0.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	12.00	29.09	40.32	0.258	240.680	0.258	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	12.80	31.52	43.52	0.267	345.572	0.267	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	13.20	32.73	45.12	0.271	410.104	0.271	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	13.60	33.94	46.72	0.276	483.854	0.276	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2757
3.00	14.40	36.36	49.92	0.284	662.852	0.284	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2840
3.17	15.22	38.84	53.18	0.292	896.007	0.292	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2922
3.33	16.00	41.21	56.32	0.300	1177.320	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2999
3.50	16.80	43.64	59.52	0.308	1532.649	0.308	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3075
3.67	17.60	46.06	62.72	0.315	1968.536	0.315	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3150
3.83	18.40	48.48	65.92	0.322	2497.888	0.322	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3222
4.00	19.20	50.91	69.12	0.329	3134.913	0.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3294
4.17	20.00	53.33	72.32	0.336	3895.187	0.336	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3363
4.33	20.80	55.76	75.52	0.343	4795.713	0.343	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3432
4.50	21.60	58.18	78.72	0.350	5854.983	0.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3499
4.67	22.40	60.61	81.92	0.356	7093.043	0.356	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3564
4.83	23.20	63.03	85.12	0.363	8531.553	0.363	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3629
5.00	24.00	65.45	88.32	0.369	10193.852	0.369	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3692
5.17	24.80	67.88	91.52	0.375	12105.017	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3755
5.33	25.60	70.30	94.72	0.382	14291.927	0.382	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3816
5.50	26.40	72.73	97.92	0.388	16783.327	0.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3876
5.67	27.20	75.15	101.12	0.394	19609.887	0.394	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3936
5.83	28.00	77.58	104.32	0.399	22804.268	0.399	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.3994
6.00	28.80	80.00	107.52	0.405	26401.180	0.405	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4052
6.17	29.60	82.42	110.72	0.411	30437.450	0.411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4109
6.33	30.40	84.85	113.92	0.416	34952.078	0.416	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4165
6.50	31.20	87.27	117.12	0.422	39986.307	0.422	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4220
6.67	32.00	89.70	120.32	0.427	45583.676	0.427	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4275
6.83	32.80	92.12	123.52	0.433	51790.090	0.433	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4329
7.00	33.60	94.55	126.72	0.438	58653.882	0.438	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4382
7.17	34.40	96.97	129.92	0.443	66225.868	0.443	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4435
7.33	35.20	99.39	133.12	0.449	74559.419	0.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4487
7.50	36.00	101.82	136.32	0.454	83710.517	0.454	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.4538

CMP #1 Discharge HMP Riser

Discharge vs Elevation Table

Low orifice:	1.50 "	Top orifice:	4 "
Number:	2	Number:	6
Cg-low:	0.61	Cg-low:	0.61
invert elev:	2.75 ft	invert elev:	4.00 ft
Middle orifice:	4 "	Emergency inlet:	
number of orif:	4	Rim height:	6.00 ft
Cg-middle:	0.61	Riser Box D	3x2
invert elev:	3.00 ft	Weir Length	10.00 ft

h	H/D-low	H/D-mid	H/D-top	Qlow-orif	Qlow-weir	Qtot-low	Qmid-orif	Qmid-weir	Qtot-med	Qtop-orif	Qtop-weir	Qtot-top	Qpeak-top	Qtot	Peak Flow WQ+HMP Qtot
(ft)	-	-	-	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0354
0.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0799
0.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1050
0.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1252
0.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1425
1.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1579
1.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1720
1.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1850
1.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.1972
1.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2086
1.83	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2194
2.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2298
2.17	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2396
2.33	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2491
2.50	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2583
2.67	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2671
2.75	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.2714
2.83	0.67	0.00	0.00	0.017	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.2900
3.00	2.00	0.00	0.00	0.052	0.069	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.3360
3.17	3.36	0.51	0.00	0.072	0.082	0.072	0.099	0.204	0.204	0.000	0.000	0.000	0.000	0.276	0.5681
3.33	4.67	1.00	0.00	0.087	0.325	0.087	0.698	0.666	0.666	0.000	0.000	0.000	0.000	0.753	1.0531
3.50	6.00	1.50	0.00	0.100	1.895	0.100	0.987	1.200	0.987	0.000	0.000	0.000	0.000	1.086	1.3937
3.67	7.33	2.00	0.00	0.111	7.153	0.111	1.208	1.605	1.208	0.000	0.000	0.000	0.000	1.319	1.6343
3.83	8.67	2.50	0.00	0.121	20.180	0.121	1.395	1.784	1.395	0.000	0.000	0.000	0.000	1.517	1.8388
4.00	10.00	3.00	0.00	0.131	47.216	0.131	1.560	1.811	1.560	0.000	0.000	0.000	0.000	1.691	2.0202
4.17	11.33	3.50	0.50	0.140	97.116	0.140	1.709	2.010	1.709	#NUM!	0.295	0.295	0.000	2.144	2.4799
4.33	12.67	4.00	1.00	0.148	181.788	0.148	1.846	3.030	1.846	1.046	1.000	1.000	0.000	2.994	3.3367
4.50	14.00	4.50	1.50	0.156	316.649	0.156	1.973	5.921	1.973	1.480	1.800	1.480	0.000	3.609	3.9589
4.67	15.33	5.00	2.00	0.164	521.067	0.164	2.093	12.215	2.093	1.812	2.407	1.812	0.000	4.069	4.4252
4.83	16.67	5.50	2.50	0.171	818.809	0.171	2.206	24.001	2.206	2.093	2.676	2.093	0.000	4.470	4.8325
5.00	18.00	6.00	3.00	0.178	1238.490	0.178	2.314	44.001	2.314	2.340	2.717	2.340	0.000	4.831	5.2004
5.17	19.33	6.50	3.50	0.184	1814.020	0.184	2.417	75.648	2.417	2.563	3.015	2.563	0.000	5.164	5.5395
5.33	20.67	7.00	4.00	0.191	2585.051	0.191	2.515	123.164	2.515	2.769	4.544	2.769	0.000	5.474	5.8561
5.50	22.00	7.50	4.50	0.197	3597.421	0.197	2.610	191.634	2.610	2.960	8.881	2.960	0.000	5.767	6.1544
5.67	23.33	8.00	5.00	0.203	4903.610	0.203	2.702	287.087	2.702	3.139	18.323	3.139	0.000	6.044	6.4375
5.83	24.67	8.50	5.50	0.209	6563.176	0.209	2.790	416.572	2.790	3.309	36.002	3.309	0.000	6.308	6.7076
6.00	26.00	9.00	6.00	0.215	8643.213	0.215	2.876	588.231	2.876	3.471	66.002	3.471	0.000	6.561	6.9665
6.17	27.33	9.50	6.50	0.220	11218.791	0.220	2.960	811.382	2.960	3.625	113.472	3.625	2.266	9.070	9.4812
6.33	28.67	10.00	7.00	0.225	14373.406	0.225	3.041	1096.593	3.041	3.773	184.745	3.773	6.409	13.448	13.8641
6.50	30.00	10.50	7.50	0.231	18199.428	0.231	3.120	1455.757	3.120	3.915	287.451	3.915	11.773	19.039	19.4611
6.67	31.33	11.00	8.00	0.236	22798.546	0.236	3.197	1902.174	3.197	4.053	430.631	4.053	18.126	25.612	26.0390
6.83	32.67	11.50	8.50	0.241	28282.219	0.241	3.272	2450.626	3.272	4.186	624.858	4.186	25.332	33.031	33.4636
7.00	34.00	12.00	9.00	0.246	34772.120	0.246	3.346	3117.450	3.346	4.314	882.347	4.314	33.300	41.206	41.6440
7.17	35.33	12.50	9.50	0.251	42400.585	0.251	3.418	3920.621	3.418	4.439	1217.073	4.439	41.963	50.070	50.5140
7.33	36.67	13.00	10.00	0.255	51311.058	0.255	3.488	4879.827	3.488	4.561	1644.889	4.561	51.269	59.573	60.0219
7.50	38.00	13.50	10.50	0.260	61658.544	0.260	3.557	6016.544	3.557	4.680	2183.635	4.680	61.176	69.673	70.1266

HMP Drawdown @		6	ft=	38.85
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
0.00	0.040	738	5.13	38.85
0.17	0.058	845	4.07	33.72
0.33	0.092	911	2.74	29.65
0.50	0.115	963	2.33	26.91
0.67	0.134	1006	2.09	24.59
0.83	0.150	1042	1.93	22.50
1.00	0.165	1074	1.81	20.57
1.17	0.179	1102	1.71	18.76
1.33	0.191	1126	1.64	17.05
1.50	0.203	1147	1.57	15.41
1.67	0.214	1166	1.51	13.84
1.83	0.225	1183	1.46	12.33
2.00	0.235	1198	1.42	10.87
2.17	0.244	1210	1.38	9.45
2.33	0.254	1221	1.34	8.07
2.50	0.263	1230	1.30	6.74
2.67	0.279	1238	1.23	5.43
2.83	0.313	1244	1.10	4.20
3.00	0.452	1248	0.77	3.10
3.17	0.811	1251	0.43	2.33
3.33	1.223	1253	0.28	1.90
3.50	1.514	1253	0.23	1.62
3.67	1.737	1251	0.20	1.39
3.83	1.929	1248	0.18	1.19
4.00	2.250	1244	0.15	1.01
4.17	2.908	1238	0.12	0.85
4.33	3.648	1230	0.09	0.73
4.50	4.192	1221	0.08	0.64
4.67	4.629	1210	0.07	0.56
4.83	5.016	1198	0.07	0.49
5.00	5.370	1183	0.06	0.42
5.17	5.698	1166	0.06	0.36
5.33	6.005	1147	0.05	0.30
5.50	6.296	1126	0.05	0.25
5.67	6.573	1102	0.05	0.20
5.83	6.837	1074	0.04	0.15
6.00	8.224	1042	0.04	0.11
6.17	11.673	1006	0.02	0.07
6.33	16.663	963	0.02	0.05
6.50	22.750	911	0.01	0.03
6.67	29.751	845	0.01	0.02
6.83	37.554	738	0.01	0.01
7.00	46.079	606	0.00	0.01
7.17	55.268	606	0.00	0.01
7.33	65.074	606	0.00	0.00
7.50	35.063			

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           00:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    00:00:00
END_DATE             08/28/1951
END_TIME             06:04:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
NODE-146         0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi
  Ksat     IMD
;;-------------- -------- ---------- ----------- ---------- ---------------------------- -------- --------
   -------- --------
CMP-100-YR-DETENTION 0        6.5        2.75       TABULAR    CMP-1                        0        0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated

;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ----------
--------
CMP-OUTLET       CMP-100-YR-DETENTION NODE-146         0          TABULAR/DEPTH   CMP-RISER                   NO


[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
CMP-100-YR-DETENTION FLOW             100-Year-Inflow-Hydrograph FLOW     1.0      1.0
```

```
[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
CMP-RISER        Rating     0.00       0.0000
CMP-RISER                   0.17       0.0354
CMP-RISER                   0.33       0.0799
CMP-RISER                   0.50       0.1050
CMP-RISER                   0.67       0.1252
CMP-RISER                   0.83       0.1425
CMP-RISER                   1.00       0.1579
CMP-RISER                   1.17       0.1720
CMP-RISER                   1.33       0.1850
CMP-RISER                   1.50       0.1972
CMP-RISER                   1.67       0.2086
CMP-RISER                   1.83       0.2194
CMP-RISER                   2.00       0.2298
CMP-RISER                   2.17       0.2396
CMP-RISER                   2.33       0.2491
CMP-RISER                   2.50       0.2583
CMP-RISER                   2.67       0.2671
CMP-RISER                   2.75       0.2714
CMP-RISER                   2.83       0.2900
CMP-RISER                   3.00       0.3360
CMP-RISER                   3.17       0.5681
CMP-RISER                   3.33       1.0531
CMP-RISER                   3.50       1.3937
CMP-RISER                   3.67       1.6343
CMP-RISER                   3.83       1.8388
CMP-RISER                   4.00       2.0202
CMP-RISER                   4.17       2.4799
CMP-RISER                   4.33       3.3367
CMP-RISER                   4.50       3.9589
CMP-RISER                   4.67       4.4252
CMP-RISER                   4.83       4.8325
CMP-RISER                   5.00       5.2004
CMP-RISER                   5.17       5.5395
CMP-RISER                   5.33       5.8561
CMP-RISER                   5.50       6.1544
CMP-RISER                   5.67       6.4375
CMP-RISER                   5.83       6.7076
CMP-RISER                   6.00       6.9665
CMP-RISER                   6.17       9.4812
CMP-RISER                   6.33       13.8641
CMP-RISER                   6.50       19.4611
CMP-RISER                   6.67       26.0390
CMP-RISER                   6.83       33.4636
CMP-RISER                   7.00       41.6440
CMP-RISER                   7.17       50.5140
CMP-RISER                   7.33       60.0219
CMP-RISER                   7.50       70.1266
;
CMP-1            Storage    0.00       3634.0
CMP-1                       0.17       4818.6
CMP-1                       0.33       5288.7
CMP-1                       0.50       5635.1
CMP-1                       0.67       5914.8
CMP-1                       0.83       6150.3
CMP-1                       1.00       6352.9
CMP-1                       1.17       6529.7
CMP-1                       1.33       6685.1
CMP-1                       1.50       6822.2
CMP-1                       1.67       6943.4
CMP-1                       1.83       7050.2
CMP-1                       2.00       7144.1
CMP-1                       2.17       7226.1
CMP-1                       2.33       7296.8
CMP-1                       2.50       7357.1
CMP-1                       2.67       7407.3
CMP-1                       2.75       7427.6
CMP-1                       2.83       7447.9
```

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CMP-1                        3.00       7479.2
CMP-1                        3.17       7501.3
CMP-1                        3.33       7514.6
CMP-1                        3.50       7519.0
CMP-1                        3.67       7514.6
CMP-1                        3.83       7501.3
CMP-1                        4.00       7479.2
CMP-1                        4.17       7447.9
CMP-1                        4.33       7407.3
CMP-1                        4.50       7357.1
CMP-1                        4.67       7296.8
CMP-1                        4.83       7226.1
CMP-1                        5.00       7144.1
CMP-1                        5.17       7050.2
CMP-1                        5.33       6943.4
CMP-1                        5.50       6822.2
CMP-1                        5.67       6685.1
CMP-1                        5.83       6529.7
CMP-1                        6.00       6352.9
CMP-1                        6.17       6150.3
CMP-1                        6.33       5914.8
CMP-1                        6.50       5635.1
CMP-1                        6.67       5288.7
CMP-1                        6.83       4818.6
CMP-1                        7.00       3634.0
CMP-1                        7.17       3634.0
CMP-1                        7.33       3634.0
CMP-1                        7.50       3634.0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100-Year-Inflow-Hydrograph 8/28/1951  0:00       0.00
100-Year-Inflow-Hydrograph 8/28/1951  0:08       0.90
100-Year-Inflow-Hydrograph 8/28/1951  0:16       0.91
100-Year-Inflow-Hydrograph 8/28/1951  0:24       0.94
100-Year-Inflow-Hydrograph 8/28/1951  0:32       0.95
100-Year-Inflow-Hydrograph 8/28/1951  0:40       0.98
100-Year-Inflow-Hydrograph 8/28/1951  0:48       1.00
100-Year-Inflow-Hydrograph 8/28/1951  0:56       1.04
100-Year-Inflow-Hydrograph 8/28/1951  1:04       1.06
100-Year-Inflow-Hydrograph 8/28/1951  1:12       1.10
100-Year-Inflow-Hydrograph 8/28/1951  1:20       1.12
100-Year-Inflow-Hydrograph 8/28/1951  1:28       1.17
100-Year-Inflow-Hydrograph 8/28/1951  1:36       1.19
100-Year-Inflow-Hydrograph 8/28/1951  1:44       1.25
100-Year-Inflow-Hydrograph 8/28/1951  1:52       1.28
100-Year-Inflow-Hydrograph 8/28/1951  2:00       1.35
100-Year-Inflow-Hydrograph 8/28/1951  2:08       1.39
100-Year-Inflow-Hydrograph 8/28/1951  2:16       1.48
100-Year-Inflow-Hydrograph 8/28/1951  2:24       1.52
100-Year-Inflow-Hydrograph 8/28/1951  2:32       1.64
100-Year-Inflow-Hydrograph 8/28/1951  2:40       1.70
100-Year-Inflow-Hydrograph 8/28/1951  2:48       1.85
100-Year-Inflow-Hydrograph 8/28/1951  2:56       1.93
100-Year-Inflow-Hydrograph 8/28/1951  3:04       2.14
100-Year-Inflow-Hydrograph 8/28/1951  3:12       2.27
100-Year-Inflow-Hydrograph 8/28/1951  3:20       2.61
100-Year-Inflow-Hydrograph 8/28/1951  3:28       2.83
100-Year-Inflow-Hydrograph 8/28/1951  3:36       3.45
100-Year-Inflow-Hydrograph 8/28/1951  3:44       3.93
100-Year-Inflow-Hydrograph 8/28/1951  3:52       5.78
100-Year-Inflow-Hydrograph 8/28/1951  4:00       8.14
100-Year-Inflow-Hydrograph 8/28/1951  4:08       29.75
100-Year-Inflow-Hydrograph 8/28/1951  4:16       4.63
100-Year-Inflow-Hydrograph 8/28/1951  4:24       3.10
100-Year-Inflow-Hydrograph 8/28/1951  4:32       2.43
100-Year-Inflow-Hydrograph 8/28/1951  4:40       2.03
100-Year-Inflow-Hydrograph 8/28/1951  4:48       1.77
100-Year-Inflow-Hydrograph 8/28/1951  4:56       1.58
100-Year-Inflow-Hydrograph 8/28/1951  5:04       1.43
```

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100-Year-Inflow-Hydrograph 8/28/1951  5:12       1.32
100-Year-Inflow-Hydrograph 8/28/1951  5:20       1.22
100-Year-Inflow-Hydrograph 8/28/1951  5:28       1.14
100-Year-Inflow-Hydrograph 8/28/1951  5:36       1.08
100-Year-Inflow-Hydrograph 8/28/1951  5:44       1.02
100-Year-Inflow-Hydrograph 8/28/1951  5:52       0.97
100-Year-Inflow-Hydrograph 8/28/1951  6:00       0.92

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
NODE-146         1110.155           6394.148
CMP-100-YR-DETENTION 1075.731           8055.077

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 08/28/1951 00:00:00
Ending Date .............. 08/28/1951 06:04:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Routing Time Step ........ 60.00 sec


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         1.243          0.405
External Outflow .........         1.054          0.343
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.407          0.133
Final Stored Volume ......         0.596          0.194
Continuity Error (%) .....        -0.029


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************

--------------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
```

Node	Type	Depth Feet	Depth Feet	HGL Feet	Occurrence days hr:min	Max Depth Feet
NODE-146	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CMP-100-YR-DETENTION	STORAGE	3.80	6.08	6.08	0 04:16	4.74

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
NODE-146	OUTFALL	0.00	8.11	0 04:16	0	0.343	0.000
CMP-100-YR-DETENTION	STORAGE	29.75	29.75	0 04:09	0.405	0.538	-0.029

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
CMP-100-YR-DETENTION	25.544	58	0	0	41.751	94	0 04:16	8.11

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
NODE-146	100.00	2.10	8.11	0.343
System	100.00	2.10	8.11	0.343

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
CMP-OUTLET	DUMMY	8.11	0 04:16			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

```
Analysis begun on:  Mon Nov  4 09:00:59 2024
Analysis ended on:  Mon Nov  4 09:00:59 2024
Total elapsed time: < 1 sec
```