TM DRAINAGE STUDY
For
OTAY RANCH - VILLAGE 8 EAST
TM22-0005

City of Chula Vista, California

Prepared for:
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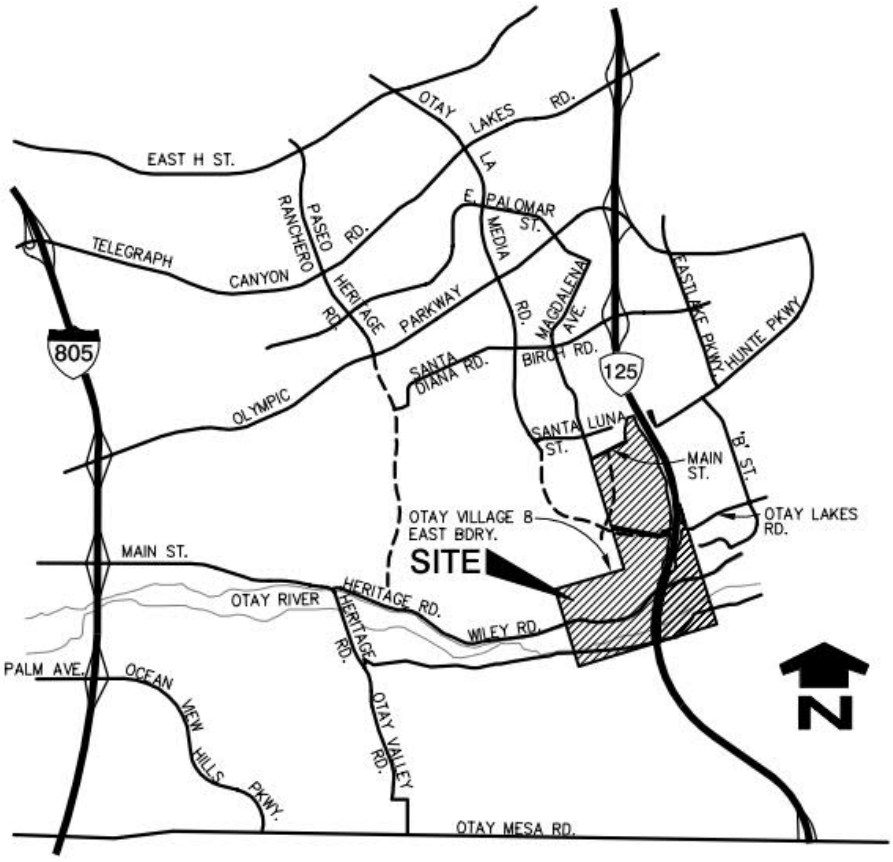
CHAPTER 1 - EXECUTIVE SUMMARY

1.1 Introduction

This Preliminary Drainage Study has been prepared to assess the pre-developed and developed condition peak runoff rates from the proposed Otay Ranch Village 8 East site for Homefed Village II Master, LLC.



VICINITY MAP

NOT TO SCALE

Otay Ranch Village 8 East is south of the extension of Main Street, north of the Otay River Valley, east of Village 8 West and west of SR-125. This urban village was originally approved by the Chula Vista City Council in 2014 and subsequently amended in 2020. Current entitlements accommodate a total of 3,276 residential units, including 943 detached homes, 1,893 attached homes and 440 multi-family units in a mixed-use setting, 20,000 square feet of retail/commercial uses, an elementary school site, a neighborhood park, and the 51.5-acre (gross) Otay Ranch Community Park South. Access to the village is provided via the extension of Main Street and La Media Parkway with emergency and pedestrian access to the community park provided along a utility corridor in the southeast portion of Village 8 East. Primary access to the community park is via existing Avenida Caprise within Village 8 West.

HomeFed Otay Land II, LLC, (Applicant), proposes to amend the Village 8 East land use plan to reflect current market conditions and housing needs and to ensure the community relates more closely to the adjacent Village 8 West community and future Village 9 planned east of SR-125. The replanning effort also addresses the redesign of the SR-125 interchanges at Main Street and La Media Parkway.

Village 8 East Proposed Land Use: The Proposed Village 8 East Land Use Plan would include a Village Core area that would accommodate a mix of uses including multi-family residential and retail/commercial uses along with an elementary school site and a centrally located neighborhood park. A future multi-modal bridge, planned to accommodate Neighborhood Electric Vehicles (NEV), bicycles and pedestrians is also planned in the Village Core linking Village 8 East and future Village 9.
The proposed project would include 20,000 square feet of commercial/retail uses and 1,348 multi-family homes distributed across eight Village Core parcels. Other residential land uses include 1,664 multi-family residential units in 10 parcels designated Medium-High Residential. The elementary school site has an underlying "High" residential land use designation that could accommodate 264 multi-family units if the site is not utilized as a school site. The project also includes an alternative elementary school site/neighborhood park site configuration which would increase the size of the elementary school site and correspondingly reduce the neighborhood park site. This alternative configuration would be implemented based on the needs of the Chula Vista Elementary School District.
The project also includes 253.6 acres of Preserve Open Space, 16.4 acres of manufactured slopes/basins and the 22.6-acre active recreation site (AR-11) located east of SR-125. Approximately 15.3 acres comprising perimeter slope areas are included in the gross acres of development parcels. The Village 8 East Final Map(s) will include open space easements over perimeter slope areas based on final engineering designs. The 43.3-acre (gross) Otay Ranch Community Park South is located south of Village 8 East. An existing water quality basin that serves Village 8 West is located in the western portion of the community park and the proposed project includes an additional water quality basin in the eastern portion of the community park to serve Village 8 East.

There will be areas within the project limits which will remain unaffected by the proposed development of Village 8 East. Examples of undisturbed areas include the Preserve, the Otay River, and areas located at the southeast corner of the boundary. The latter two were considered in the overall Otay River (HEC-HMS) hydrologic analysis included in Appendix A. However, they were not included within the local rational-method hydrologic analysis for Village 8 East included in Chapter 3 and 4. For this reason, total acreages listed in the SPA Plan Area will not correlate with the total watershed acreages listed below and included in the hydrologic analysis. For comparison purposes, the pre and post development hydrologic study areas presented in this study were set to match. Discharge points along the project (hydrologic) boundary were identified based on actual (for existing condition) and expected (for proposed condition) outlet points.

The hydrologic watershed acreage affected by the development is approximately 545 acres. The southern portion of the site adjacent of the Otay River will include a park and a water quality basin for treatment of site runoff. Refer to Chapter 4 Exhibits 1 and 2 for an overview of the existing and proposed drainage patterns of the site.

The entire Village 8 East site drains south towards the Otay River in both the pre and post developed conditions. The Regional Water Quality Control Board has identified the Otay River as part of the Otay Hydrologic Unit and Otay Valley Hydrologic Area (basin number 910.20). Per the Flood Insurance Rate Map Nos. 06073C2178 and 06073C2179, the developed areas of the site will be outside the FEMA floodplain boundary. Therefore, a Letter of Map Revision is not required. See Exhibit 1.3 for an overlay of the site on Flood Insurance Rate Map. The Multiple Species Conservation Program (MSCP) Open Space Preserve Area is located immediately south of the developed areas and north of the community park along the Otay River. The development of Otay Ranch Village 8 East, as proposed in the TM, does not encroach into the existing (MSCP) Open Space Preserve Area with the exception of the proposed park access roads and storm drain and sewer outfalls which will have an assigned easement through the preserve.

A HEC-HMS hydrologic analysis wasrun to determine the pre and post-development runoffs within the Otay River watershed at the major downstream outlet points of the Village 8 East development. This analysis also determined the expected lag times associated with the overall upstream Otay River watershed. The lag time was used to compare with the local ‘Village 8 East’ peak times to the Otay River at the projects downstream outlet location. This analysis is included in Appendix A. Using the calculated flows from the HEC-HMS results, the HEC-RAS program was used to determine the pre and post development flow depths and velocities within the Otay River at the major proposed outlet location. Separately, the preliminary storm drain outlet velocity was calculated for the major storm drain outlet based on using an APWA impact basin energy dissipator at the outlet. Please refer to Appendix B for HEC-RAS and impact basin calculations

Using the results from the HEC-HMS analysis, the HEC-RAS river analysis program was used to determine pre and post development flow depths and velocities within the Otay River at the two proposed outlet locations. The models helped to establish the maximum velocities acceptable at the proposed discharge location from the site. The preliminary storm drain outlet velocity was calculated for the major storm drain system based on using an APWA impact basin energy dissipator at the outlet. Please refer to Appendix B for HEC-RAS and impact basin calculations.

Per County of San Diego drainage criteria, the Modified Rational Method should be used to determine peak design flow rates when the contributing drainage area is less than 1.0-square mile. Since the total watershed area discharging from the Otay Ranch Village 8 East site is less than 1.0-square mile, the AES-2003 computer software was used to model the runoff response per the Modified Rational Method.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the most current "San Diego County Hydrology Manual" and the "City of Chula Vista Subdivision Manual". A more detailed explanation of methodology and model development used for this analysis is listed in Chapter 2 of this report.

1.2 Summary of Pre-Developed Conditions

The topography for existing Village 8 East project area is characterized by farmland, rolling hills, vegetation consisting mainly of brush and incised canyons that partition the site into several defined watersheds whose drainage patterns will be affected by the proposed Village 8 East development. The pre-development condition has nine distinguishable watersheds (see See Exhibit 1 in Chapter 4, and table 1 below). As shown on the Existing Condition Hydrology Map, approximately 13.72 acres within the northeast portion of the site currently drains towards an existing storm drain located at the eastern edge of Main Street (Rock Mountain Road). This runoff is directed west and connects to the Village 8 West development at the intersection of Main Street and Magdalena Avenue to the "North Watershed". The "Northwest Watershed" is composed by approximately 10.11 acres of undeveloped slopes sheet flowing to the west of the development and into Village 8 West. The "West Watershed" consists of 14.26 acres of undeveloped slopes draining south and toward the westerly portion of the project. The "Southwest Watershed" is tributary to some undeveloped slopes as well as 181.2 acres of the Village 8 West development that drain southerly to and existing water quality basin proposed as part of the aforementioned site; the flows commingle with approximately 27.56 acres of hilly and steep natural slopes (node 76) . The "South Watershed" is solely composed by 25.94 acres of natural slopes draining southerly towards the Otay River. The "East Central Watershed" consists of 180.32 acres of natural slopes draining southerly and discharging to the Otay River. The "East Watershed" also drains to the Otay River but it only delineates approximately 19.96 acres. The "Southwest and Northeast Watersheds" are also slopes that drain easterly towards SDR-125 but have the Otay River as their ultimate discharge point. These watersheds consist of 13.28 and 51.54 acres of slopes for the Southwest and the Northeast watersheds respectively. Runoff along the upper portion of the eastern boundary is conveyed via trapezoidal channel and storm drain. A storm drain directs this runoff to the east side of SR125. The southern portion is channeled south along the eastern project boundary en route to the Otay River.

The northern half of Main Street currently extends approximately 1,130 feet east of the Magdalena Avenue – Main Street intersection. This constructed street portion allows access to Olympian High School located on its north side. As part of this TM, a small area within the northeast portion of the project boundary will be developed as Neighborhood R-16. However, this area is currently undeveloped and drains towards the current eastern limit of Main Street. A headwall and storm drain direct this runoff west along Main Street within the existing storm drain which will tie in to the Village 8 West storm drain. The Village 8 West storm drain will outlet into the Otay River downstream.

The remaining areas within the project boundary currently drain via the incised canyons located throughout the site. These canyons flow south and empty directly into the Otay River. The Otay River flows from east to west accumulating runoff from each tributary canyon along the way. The Otay River empties into the San Diego Bay approximately 8.5 miles downstream.

Table 1 below summarizes the 100-year pre-development peak flows to each of the delineated watersheds shown in Exhibit 1. A runoff coefficient of 0.50, 0.60, or 0.75 was assumed for the existing tributary area per the San Diego County Hydrology Manual. These coefficients correspond to farm land, vegetated rolling and steep slopes, as well as paved surfaces.

TABLE 1 - Summary of Pre-Developed Flows to the Otay River

Discharge Location	Node Number	Drainage Area (ac)	100-Year Peak Flow (cfs)
North Watershed	612	13.72	28.62
Northwest Watershed	302	10.11	21.75
West Watershed	403	14.26	27.18
Northeast Watershed	705	51.54	75.59
Southwest Watershed	802	208.76	380.71
South Watershed	203	25.94	50.66
East-Central Watershed	511	180.32	211.11
East Watershed	552	19.96	45.72
Southeast Watershed	104	13.28	25.93
Total		**537.89**	**867.27**

Supporting calculations for the data presented in Table 1 are located in Chapter 3 of this report. The corresponding hydrology map is Exhibit 1.1 in Chapter 4.

1.3 Summary of Developed Conditions

The Otay Ranch Village 8 East Tentative Map will consist of mixed use area, multi-family residential dwelling units, park areas, community purpose facilities, a school site, open space areas, and paved roads. A community park and recreation site will be located between the Preserve and the Otay River. The park site has been included in the analysis within this study.

Main Street, which has partially been constructed between the Village 8 West boundary and SR125, will be completed and extend east through the Village 8 East development. As shown on Exhibit 2, Developed Condition Hydrology Map, the developed areas of the Village 8 East project will almost entirely consist of residential development for multi-family dwelling residences. A school site, community purpose facilities, and parks will also be included. A water quality basin located at the southwest corner of the site adjacent to the Otay River will treat a portion of the community park while a basin with proprietary biofiltration units downstream will treat Village 8 East stormwater runoff in compliance of City of Chula Vista Standard Urban Stormwater Mitigation Plan (SUSMP) requirements for water quality. More detailed discussion will be provided in the *Priority Development Project (PDP) Stormwater Quality Management Plan (SWQMP) for Village 8 East TM* dated May 2023.

The post-development condition has five distinguishable watersheds summarized below: The “North Watershed” like in the existing conditions conveys flow from Main street and into the Village 8 West development storm drain; the watershed only bounds approximately 7.79 acres of road in this condition. The “Northeast Watershed” and “Southeast Watershed” consist of 17.50 and 1.74 acres respectively of existing and proposed slopes draining away from the project and towards SDR-125 where it will be routed by a trapezoidal channel into the Otay River. The “Southwest Watershed” is still tributary of 181.20 acres of the Village 8 West development and existing slopes. The development of Village 8 east adds more area to this watershed by discharging DMA 2 (a portion of the regional park) for a total of 230.42 acres. Finally, the “East Watershed” is tributary to all the imperviousness associated with the development of Village 8 East (this includes public and private roads, multifamily sites, commercial sites, schools, open space areas, and a remaining acreage of the regional park not draining west) for a total of 288.39 acres.

The storm drain system within the Village 8 East development will consist of inlets, catch basins, RCP pipe, cleanouts, and headwalls. The 50-year event has been analyzed to provide estimated pipe sizes throughout the project using AES sizing function. During the final engineering design phase, this system will be designed to convey the peak 50-year flows through the site and outlet into the Otay River. The entire developed site with its neighborhoods and streets will generally slope towards the southern project boundary.

Although the Village 8 East site has two major outflall locations, the majority of the onsite runoff is conveyed by the eastern storm drain system. The western storm drain system conveys the offsite developed flow from the Village 8 West development and will confluence onsite flows from the western portion of the park site and a portion of the Preserve area which is located within the project boundary. The eastern storm drain will be routed towards the southeastern corner of the development in the vicinity of the proposed basin. The proprietary biofiltration units located downstream of the project will treat the ‘first flush’ (85^{th} percentile) flows. To direct these lower water quality flows (compared to the peak flows), a cleanout with an internal diversion will be located at the downstream portion of the system. The

cleanout's invert will be set below that of the peak flow outlet pipe which will allow peak flows to continue towards the discharge point at the Otay River.

Table 2 below summarizes the 100-year developed condition peak flows to each of the site's discharge locations. Runoff coefficients assumed for the proposed roads, multi-family development, single family development, school site, and park sites are per the City of Chula Vista Subdivision Manual.

TABLE 2 - Summary of Developed Flows to Otay River

Discharge Location	Node Number	Drainage Area (ac)	100-Year Peak Flow (cfs)
North Watershed	305	7.79	32.35
Northeast Watershed	503	17.50	22.13
Southwest Watershed	602	230.42	400.61
East Watershed	198	288.39	774.35
Southeast Watershed	406	1.74	3.94
Total		**545.84**	**1233.38**

Supporting calculations for the data presented in Table 2 is located in Chapter 3 of this report. The corresponding hydrology map is Exhibit 2 in Chapter 4.

As evident on the pre and post condition hydrology maps, the majority of the runoff from the developed portion of Village 8 East will be discharged upstream of its natural confluence point with the Otay River. Therefore, analyses at the proposed discharge points were conducted to determine the impact at the outfalls and recommend outlet facilities to address erosivity concerns. A pre and post condition HEC-HMS analysis was run for the Otay River Watershed to determine expected river flows at the downstream end of the Village 8 East project boundary. Appendix A contains the HEC-HMS model. These flows were then used for the pre and post condition HEC-RAS analysis performed at the two proposed outfall locations. See Appendix B for HEC-RAS calculations. Comparison of pre and post condition flow velocities and depths do not show any increases caused by the Village 8 East development. The flow velocities obtained from the HEC-RAS models established the existing and maximum acceptable velocities at the two outlet locations. Using the peak flows from the developed condition hydrologic analysis, a preliminary hydraulic analysis was performed to determine expected outlet velocities and recommend dissipation measures needed to reduce velocities to below existing condition. Calculations during the final engineering stage will help determine the appropriate and necessary energy dissipating measures at each respective outlet. Alternatives such as D-41 headwalls or APWA energy dissipating impact basins will be considered along with rip rap.

Preliminary calculations have been included at the end of Appendix B and include determination of the expected velocity at the downstream end of the proposed rip rap. Calculations indicate that velocities were reduced to 5.04 fps.

Where possible, landform grading has been incorporated to mimic existing conditions where the proposed grading ties into or daylights with the existing terrain. It is intended that the stormwater from the manufactured slopes will sheet flow and follow the existing drainage patterns.

1.4 Results & Recommendations

Table 3 summarizes the effects of site development at the receiving Otay River.

TABLE 3 - Summary of Pre vs. Post-Developed Flows from Village 8 East

	PRE-DEVELOPED		POST-DEVELOPED		DIFFERENCE	
Discharge Location	**Drainage Area (ac)**	**100-Year Peak Flow (cfs)**	**Drainage Area (ac)**	**100-Year Peak Flow (cfs)**	**Area (ac)**	**100-Year Peak Flow (cfs)**
North Watershed	13.72	28.62	7.79	32.35	-5.93	+3.73
Northwest Watershed	10.11	21.75	N/A	N/A	-10.11	-21.75
West Watershed	14.26	27.18	N/A	N/A	-14.26	-27.18
Northeast Watershed	51.54	75.59	17.50	22.13	-34.04	-53.46
Southwest Watershed	208.76	380.71	227.65	400.61	+21.66	+19.90
South Watershed	25.94	50.66	N/A	N/A	-25.94	-50.66
East-Central Watershed	180.32	211.11	N/A	N/A	-180.32	-211.11
East Watershed	19.96	45.72	288.39	774.35	+267.53	+728.63
Southeast Watershed	13.28	25.93	1.74	3.94	-11.54	-21.99
Total	**537.89**	**867.27**	**545.84**	**1233.38**	**+7.95**	**+366.11**

Development of Otay Ranch Village 8 East TM results in the net increase of runoff discharged to the adjacent Otay River by approximately 366 cfs.

Per the *Otay River Watershed Management Plan* prepared in May 2006 by Aspen Environmental Group, the Otay River Watershed at the existing Otay Valley Road/Heritage Road bridge crossing is approximately 122.7 square miles.
This bridge crossing is approximately 2.2 miles downstream of Village 8 East. The flow for the Otay River at this location is approximately 22,000 cfs (100-year storm

event). Although the Savage Dam at the Lower Otay Reservoir impounds runoff from over 60 percent of the Otay River's tributary watershed, the analysis included in this study assumes that the dam is full at the beginning of the rain event. The full report mentioned above can be accessed at the following website: http://www.sdcounty.ca.gov/dplu/docs/05-06FinalDraft_OtayRiverWMP.pdf.

The *Otay River Watershed Management Plan* (Section B.5.3) notes that the existing Otay River downstream of the dam is starved for sediment and peak flows, stating "Theoretically, an increase in peak flow would tend to counteract the degradation trends by replacing water impounded by the reservoir and helping the River maintain its original platform". In addition, the time of concentration for the peak flows at the proposed 'Village 8 East' eastern outlet to the Otay River is approximately 12 minutes. For the proposed western outlet, which includes the future 'Village 2 West' development, the time of concentration is about 21.0 minutes, as detailed in Section 3.2.

Considering that the Otay River watershed area spans over 100 square miles, a substantial delay is expected between the peak flows exiting the proposed development and the peak flows along the Otay River reaching the proposed eastern outlet location. The Village 8 East drainage area represents 9.2% of the Otay River Valley Center Subarea. According to the HEC-HMS study for a 100-Year, 24-hour storm event, the time to peak at the Village 8 East outlet along the Otay River is approximately 21 hours, whereas it's 17 hours for the Otay River Valley Center Subarea. This creates a lag time of over 4 hours. Due to this lag time, there is no net increase of flows to the Otay River from the development of Village 8 East when compared to existing conditions. Therefore, no detention basins are proposed for this project other than a basin with proprietary biofiltration units downstream of it and a biofiltration basin which will be used solely as a water quality device. Please refer to Appendix A for HEC-HMS supporting calculations.

The San Diego Bay Watershed Management Area Water Quality Improvement Plan and the City of Chula Vista BMP design manual were used for hydromodification guidance for this project. The manuals specified above exempt the Otay River from hydromodification criteria. The two major storm drain discharge points proposed for Otay Ranch Village 8 East outlet directly into the Otay River. Therefore, the areas from which their runoff is generated are considered exempt from hydromodification requirements. Two outlets along the eastern project boundary, labeled Northeast Watershed and Southeast Watershed on the attached exhibits, will need to address hydromodification requirements since they do not directly discharge into the Otay River. These two watersheds almost entirely consist of pervious areas in both pre and post conditions and will be reduced in size once developed. Per the city of Chula Vista BMP manual, an HMP exemption can be applied to areas that will not experience increases in both imperviousness and in unmitigated peak flows. The Southeast Watershed qualifies for this exemption. However, the Northeast Watershed will increase its impervious areas once the SR-125/ Main Street interchange is constructed. Further hydromodification analysis is required for the Northeast Watershed and is included in Chapter 4 of this report. In regard to the northeast portion of the project area (R-16), this area also qualifies for HMP

exemption since it will tie in to the Village 8 West storm drain which will directly discharge into the Otay River downstream. Formal discussion, calculations, and analysis regarding hydromodification for Village 8 East are included in Chapter 4 of the *Village 8 East Master Water Quality Technical Report*.

The main storm drain outfalls from the proposed Village 8 East development will outlet directly to the Otay River. The outlets are located at the southeast and southwest corners of the development. All outlet locations are shown on Exhibit 2 (Chapter 4). The storm drain at the outlet points will be reinforced concrete pipe ranging in diameter sizes between 60" to 84". Ultimate size will be determined during the final engineering design phase. Concrete energy dissipator devices per San Diego Regional Standard Drawings D-41 (or APWA Impact Basin 384-0) and rip-rap apron will be constructed to reduce velocities as dictated by the standard drawings prior to outletting to the Otay River.

A HEC-HMS (hydrologic) and HEC-RAS (hydraulic) analysis was also prepared as part of this study to determine velocities and flows in the Otay River at the two Village 8 East storm drain outlets. The HEC-HMS study shows that there is no net increase of flows to the Otay River from the development of Village 8 East when compared to existing condition (about 0.03% increase and it is still less than the flow of the river per FEMA FIS which is 22,000 cfs). This can be attributed to the differences in lag times as previously discussed above. The HEC-RAS study calculates the approximate velocities in the Otay River to be between 6.35 and 7.34 fps at the two discharge locations during the 100-year, 24-hour storm event. Energy dissipation at the storm drain outlet will be addressed by constructing a headwall with vertical baffle wall to reduce outlet velocities below 7.34 fps. Appendix C includes a preliminary velocity calculation at the outlet end of an APWA Energy Dissipator- Impact Basin with Vertical Baffle Wall. Average preliminary velocities of 5.88 fps and 7.78 fps were calculated at the outlets for the east and west outlets, respectively. See Appendix C.

Table 4 summarizes pre and post-development runoffs within the Otay River watershed at the major downstream outlet points of the Village 8 East development. It also accounts for the expected lag times associated with the overall upstream Otay River watershed.

TABLE 4 - Summary Of Pre And Post-Developed Runoffs And Lag Times Within The Otay River At The Downstream Outlet Points Of The Village 8

	PRE-DEVELOPED			POST-DEVELOPED			DIFFERENCE	
Outfall Location	**Drainage Area (Mi^2)**	**100-Year Peak Flow (CFS)***	**Time of Peak (lag time) (Hr: Min)**	**Drainage Area (Mi^2)**	**100-Year Peak Flow (CFS)***	**Time of Peak (Lag time) (Hr: Min)**	**Area (Mi^2)**	**100-Year Peak Flow (CFS)***
Village 8 Outfall(1)	115.954	19619.13	20:30	115.954	19625.37	20:30	0	+6.24 (+0.032%)
Ex. Otay Valley Road (2)	120.865	20345.45	20:40	120.865	20351.71	20:40	0	+6.26 (+0.031%)

***Summary table reflects values for the 100 year, 24 hour event**

In addition, Appendix B includes further analysis of the proposed rip rap at the east outlet and determined that flow velocities were reduced to 5.04 fps. A rip rap analysis for the western outlet was not included since that outlet is part of the Village 8 West project.

Erosion Control: The developer shall monitor any erosion at the project's outfalls at the Otay River and, prior to the last building permit for the project, obtain approval for and complete any reconstructive work necessary to eliminate any existing erosion and prevent future erosion from occurring, all to the satisfaction of the Development Services Director.

Scour Analysis: Concurrent with all grading plan submittals, the applicant shall prepare a scour analysis for all structures within the 100-year flood hazard area. Additionally, all said structures shall be monitored until the last building permit for the project has been issued.

Prior to discharge from the site, all developed site runoff will receive full water quality treatment in accordance with the most current City of Chula Vista Storm Water Manual standards applicable at the time of final engineering. Therefore, groundwater should not be impacted. The project will be designed to avoid violation of any water quality standards or waste discharge requirements. Storm water treatment design is further discussed in the *Master Water Quality Technical Report for Otay Ranch Village 8 East Tentative Map*.

No impacts are anticipated from the proposed canyon subdrains which will carry low and dry weather flows. The flow associated with the canyon drains is clean as any flow would have percolated through the various layers of soil and would have been filtered prior to its discharge. Appendix C includes the geologic maps for Village 8 East and a typical subdrain outlet detail which includes velocity dissipation measures.

Summary:

- Drainage facilities within Village 8 East will be designed in accordance with the requirements of the Chula Vista Subdivision Manual, the San Diego County Hydrology Manual and the requirements of the San Diego Regional Water Quality Control Board.

- Peak discharge flows from the Otay River Valley Center Subarea, of which the proposed project's drainage area constitutes 9.2%, will take approximately 17 hours to reach their peak following the 100-Year-24hr storm event. In comparison, the peak discharge flow from the entire Otay River Basin at the downstream Village 8 East outlet will occur more than 20 hours after the onset of the storm. Due to this difference in time, the projects direct, indirect impacts are not significant.

- Due to the detaining effects of the Savage Dam and Lower Otay Reservoir, detention and hydromodification basins are not proposed for this project.

- Development of the project site will not further degrade potential beneficial uses of downstream water bodies as designated by the Regional Water Quality Control Board, including water bodies listed on the Clean Water Section 303d list.

- Onsite and offsite drainage easements shall be provided to the satisfaction of the Director of Public Works.

- Additional calculations for the following items will be included with the Drainage report for final engineering:

    - Street capacity
    - Inlet sizing
    - Hydraulics
    - Sediment basin sizing

References

City of Chula Vista Subdivision Manual; Engineering Department and Land Development; Section 3, March 2012

City of Chula Vista BMP Design Manual; August 2021

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

San Diego Bay Watershed Management Area Analysis prepared by Rick Engineering on April 2015.

Drainage Study for Otay Ranch Village 8 West prepared by Hale Engineering, approved on December 2019

Rough Grading Plans for McMillin Otay Ranch –Village 7 prepared by Rick Engineering Company, January 2005.

Drainage Study for McMillin Village 7 Vista Verde prepared by Rick Engineering, dated November 29, 2004

Order No. R9-2013-0001; NPDES No. CAS 0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region (Regional MS4 Permit).

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"Otay Ranch Village 8 East TM PDP SWQMP", Hunsaker & Associates; May 2023.

CHAPTER 2 - METHODOLOGY

2.1 - Rational Method Model Development Summary

Computer Software Package – AES-2010

Design Storm – 100-Year Return Interval (TM phase)

Land Use – School, Park, Multi-Use, Multi-Family, Single Family, Community Purpose Facilities, and Open Space

Soil Type - Hydrologic soil group D was used for all areas since the site consists chiefly of soil type Groups C and D. Using soil group D is the most conservative assumption. For additional soil information for Village 8 East, please reference the *Geotechnical Investigation for Otay Village 8 East* prepared by Geocon Incorporated, dated April 2013. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission.

Runoff Coefficient – In accordance with the City of Chula Vista Subdivision Manual, a runoff coefficient of 0.90 was used for fully paved areas, 0.85 for the School Site, 0.75 for the Multi-Family Sites and dense residential, 0.60 for proposed vegetated slopes, 0.45 for proposed open space, and 0.30 for parks.

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 mile, 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 an initial subarea (generally 1 lot) and subsequent subareas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each subarea.

(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 = C I A.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to the particular 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-2010 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipeflow travel time (computer estimated).
4. Pipeflow 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 area.
10. Copy main stream data to memory bank
11. Confluence main stream 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 is based on the assumption that each basin's hydrographs are triangular in shape.

(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.

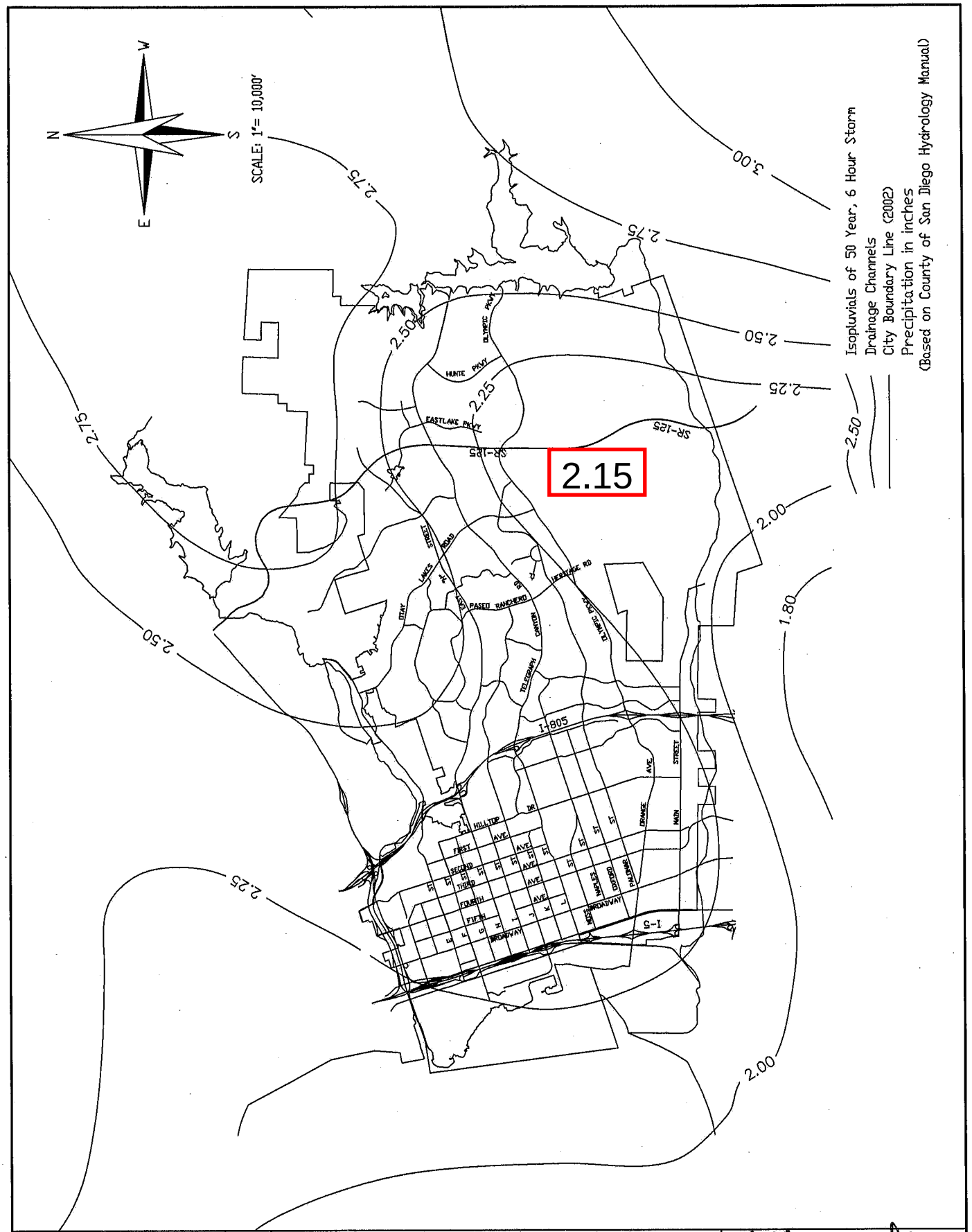
$Q_p = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.2 – Design Rainfall Determination

100-Year, 6-Hour and 50-Year, 6-Hour Rainfall Isopluvial Maps from City Of Chula Vista San Diego County Hydrology Manual June 2003



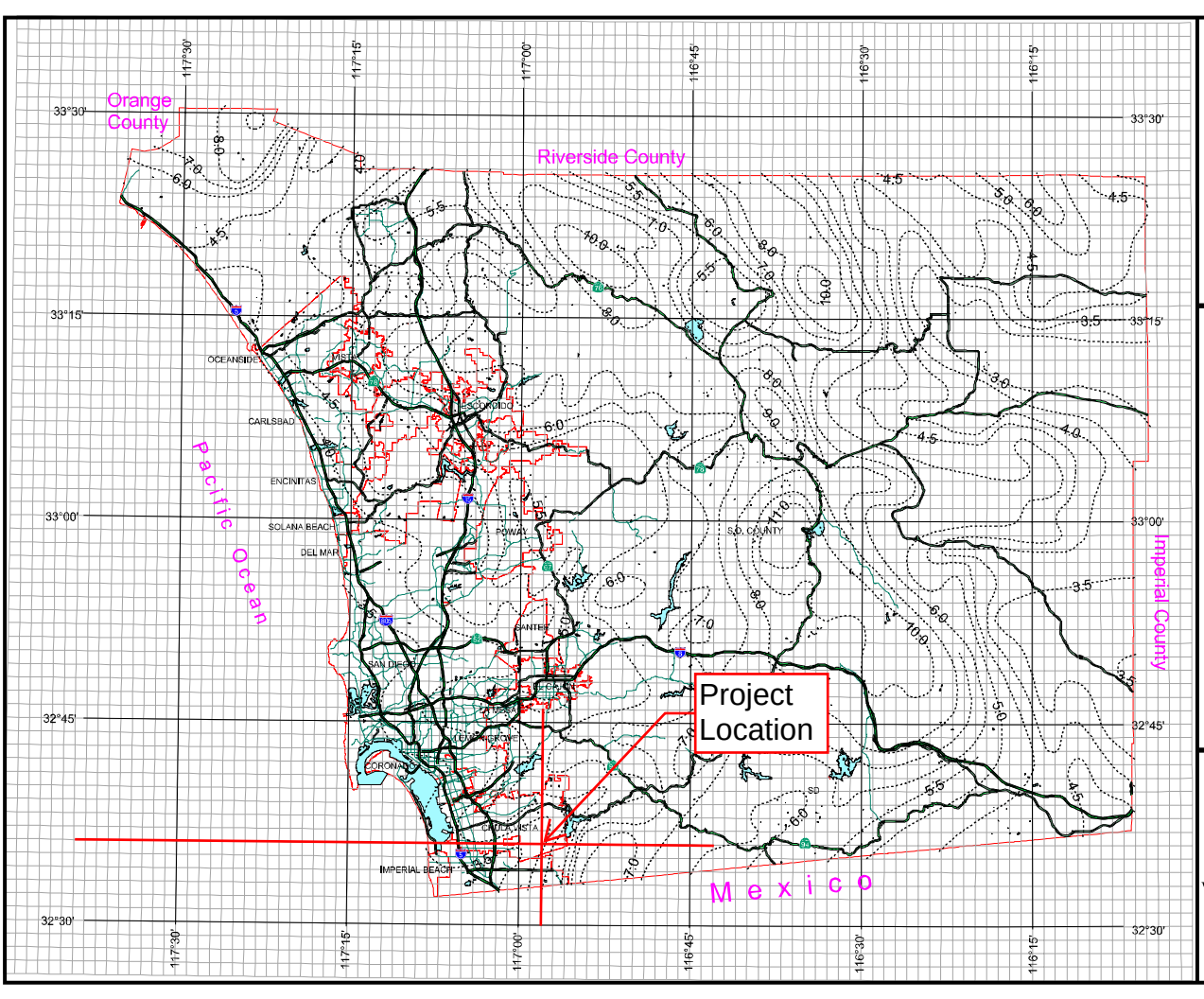
REVISION	BY	APPROVED	DATE
ORIGINAL			01/02
REVISION	CVM	C. SWANSON	11/02
REVISION	DPH	W. VALLE	11/17

CITY OF CHULA VISTA
ENGINEERING & CAPITAL PROJECTS
STANDARD DRAWING

50-YEAR, 6-HOUR PRECIPITATION

WILLIAM S. VALLE 11/21/2017
CITY ENGINEER

DRN-03



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

32°36'13"
-116°58'12"
P6=4.0

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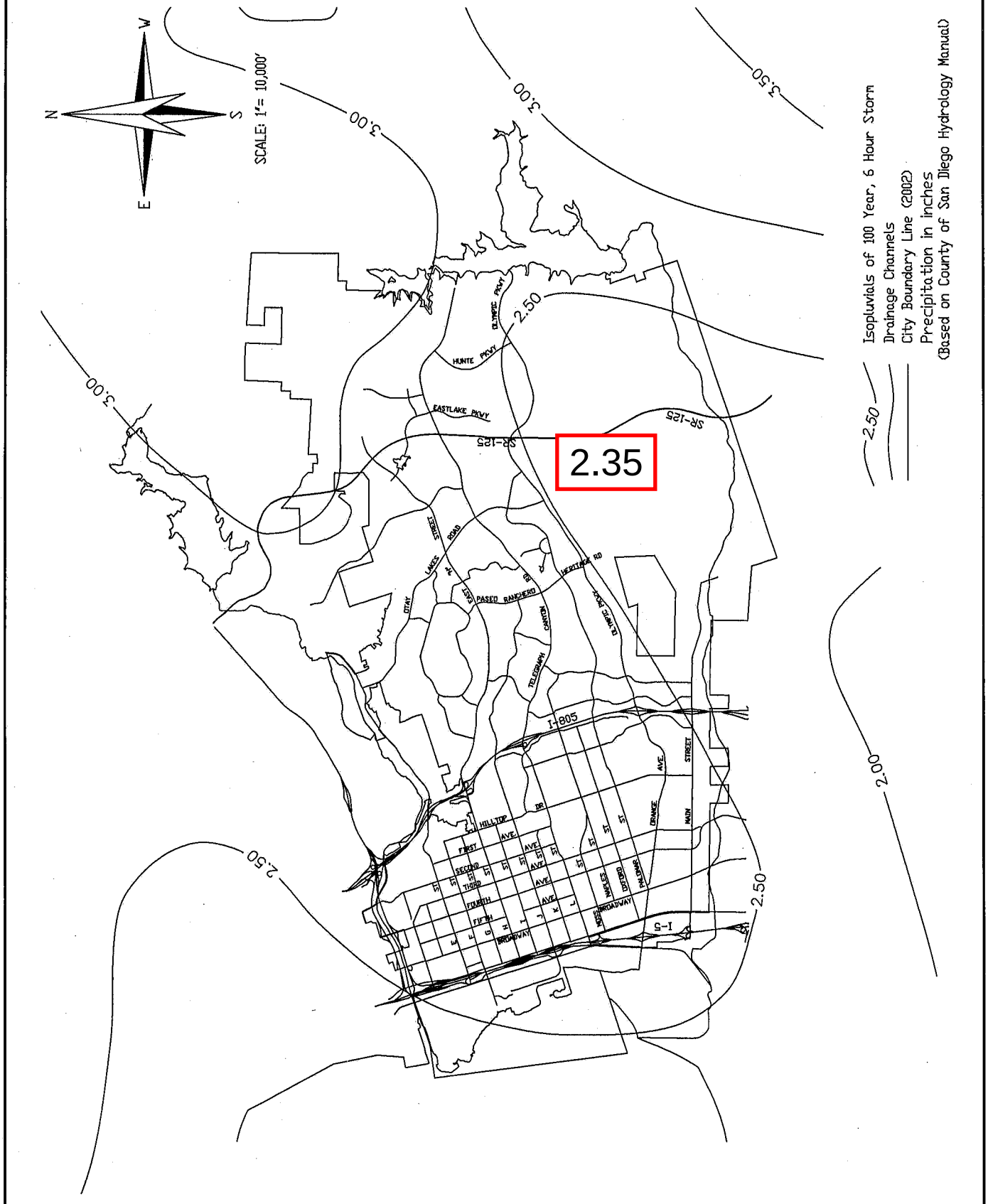
3 0 3 Miles



REVISION	BY	APPROVED	DATE
ORIGINAL			01/02
REVISION	CVM	C. SWANSON	11/02
REVISION	DPH	W. VALLE	11/17

CITY OF CHULA VISTA
ENGINEERING & CAPITAL PROJECTS
STANDARD DRAWING

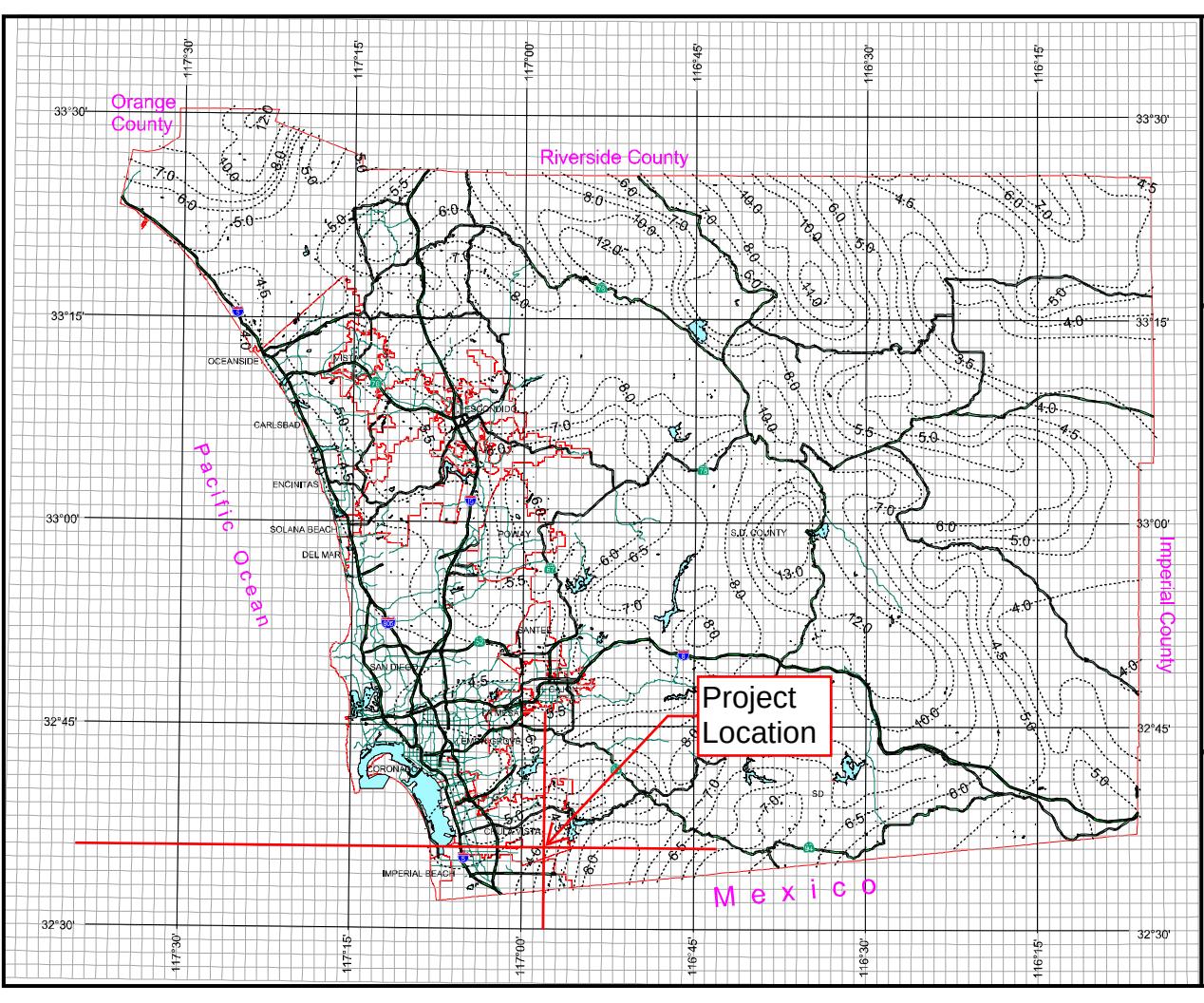
100-YEAR, 6-HOUR PRECIPITATION

WILLIAM S. VALLE 11/21/2017
CITY ENGINEER

DRN-04

County of San Diego Hydrology Manual

Rainfall Isopluvials



100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

32°36'13"
-116°58'12"
P6=4.25

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Geographic Information Services

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3 0 3 Miles

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.3 – Runoff Coefficient Determination

3-203 Hydrology

Developers draining to a river or stream will be required to use the latest adopted County Hydrology Manual to determine the flows expected at a given frequency (Q10, Q50 Q100, etc,) Infill developments will use the following Hydrology requirements. The City Engineer will determine which projects may be considered "infill" projects.

3-203.1 Previously Approved Reports

Runoff quantities; as set forth or derived from the report prepared by Lawrence, Fogg, Florer and Smith titled "A Special Study of Storm Drain Facilities" on file in the office of the City Engineer may be used in the design of drainage facilities in Chula Vista. A hydrologic study prepared and approved at General Development Plan (GDP) or Specific Planning Area (SPA) plan may be used as determined by the City Engineer.

3-203.2

For local drainage basins, storm discharge flow may be estimated based on the Rational Method or the Modified Rational Method. For all lateral and major drainage basins the SCS method, U.S. Army Corps of Engineers HEC-1 computer method or other tabular or computer method may be used upon City Engineer approval.

3-203.3 Rational and Modified Rational Methods

(1) The rational method equation relates storm rainfall intensity (I), a selected runoff coefficient (C) and drainage area (A) to the peak runoff rate (Q):

$$Q = CIA \text{ (Empirical Units)}$$

where:

Q = Peak runoff in cubic feet per second
C = Runoff coefficient
I = Intensity, inches per hours
A = Drainage basin area in acres

Or

$$Q=0.278CIA \text{ (Metric Units)}$$

where:

Q = Peak runoff in cubic meters per second
C = Runoff coefficient
I = Intensity in millimeters per second
A = Drainage area in square kilometers

(2) Coefficient of Runoff: Consider probable development. Use highest number of the following values:

a)	Paved Surface	0.90
b)	Commercial Area	0.85
c)	Dense Residential (R2, R3)	0.75

d)	Normal Residential (R1)	0.65
e)	Suburban Property (RE)	0.55
f)	Barren Slopes Steep	0.80
g)	Barren Slopes Hilly	0.75
h)	" " Rolling	0.70
i)	" " Flat	0.65
j)	Vegetated Slopes Steep	0.60
k)	" " Hilly	0.55
l)	" " Rolling	0.50
m)	" " Flat	0.45
n)	Farm Land	0.35
o)	Parks, Golf Courses	0.30

NOTES:
Steep = Steep, rugged terrain with average slopes generally above 30%.
Hilly = Hilly terrain with average slopes of 10% to 30%.
Rolling = Rolling terrain with average slopes of 5% to 10%.
Flat = Relatively flat land, with average slopes of 0% to 5%.
Composite = Where drainage areas are composed of parts having different runoff characteristics, a weighted coefficient for the total drainage area may be used.

The runoff coefficient for a basin should be a composite coefficient made of the many different runoff coefficients for the sub-areas of the basin per equation:

$$\frac{CA_T = C_1A_1+C_2A_2+\ldots CnAn}{n}$$

(3) Time of Concentration (t_c = minutes) is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration. With exceptions for limited natural watersheds, the time of concentration shall be calculated as follows:

a) $t_c = t_i + t_f$ where:

t_i = Initial time or overland flow time of concentration, the time required for runoff to flow to the first inlet or to the street gutter

t_f = Travel time of concentration, the time required for runoff to flow within street gutters to inlets, with channels or within storm drain pipes.

b) t_i may be calculated using the following natural watershed flow formula:

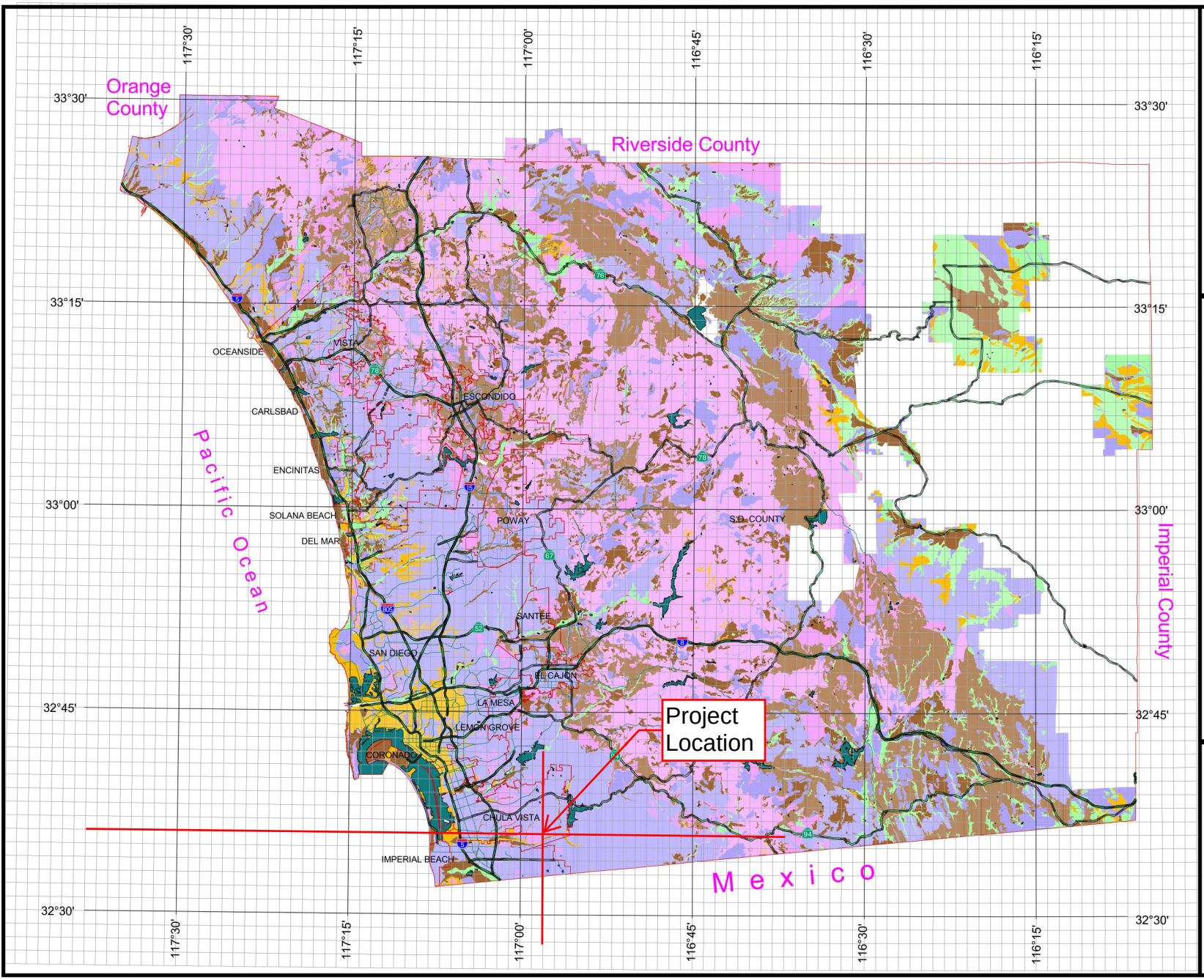
$$t_i = 60x\ [(11.9L^3)/H]^{0.385}$$

L = Length of water shed (miles)
H = Difference in elevation from furthermost point to the design point (feet).

For the proposed road drainage areas, the runoff coefficient was calculated as a weighted average, with 0.9 assigned for paved surfaces, 0.45 for landscape parkways, and 0.6 for slopes. Although the actual imperviousness of these roads is under 85% (as detailed in the street cross-sections), an imperviousness value of 88% was adopted for these calculations.

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

32°36'13"
-116°58'12"
Site is soil type D per the San Diego County Hydrology Manual

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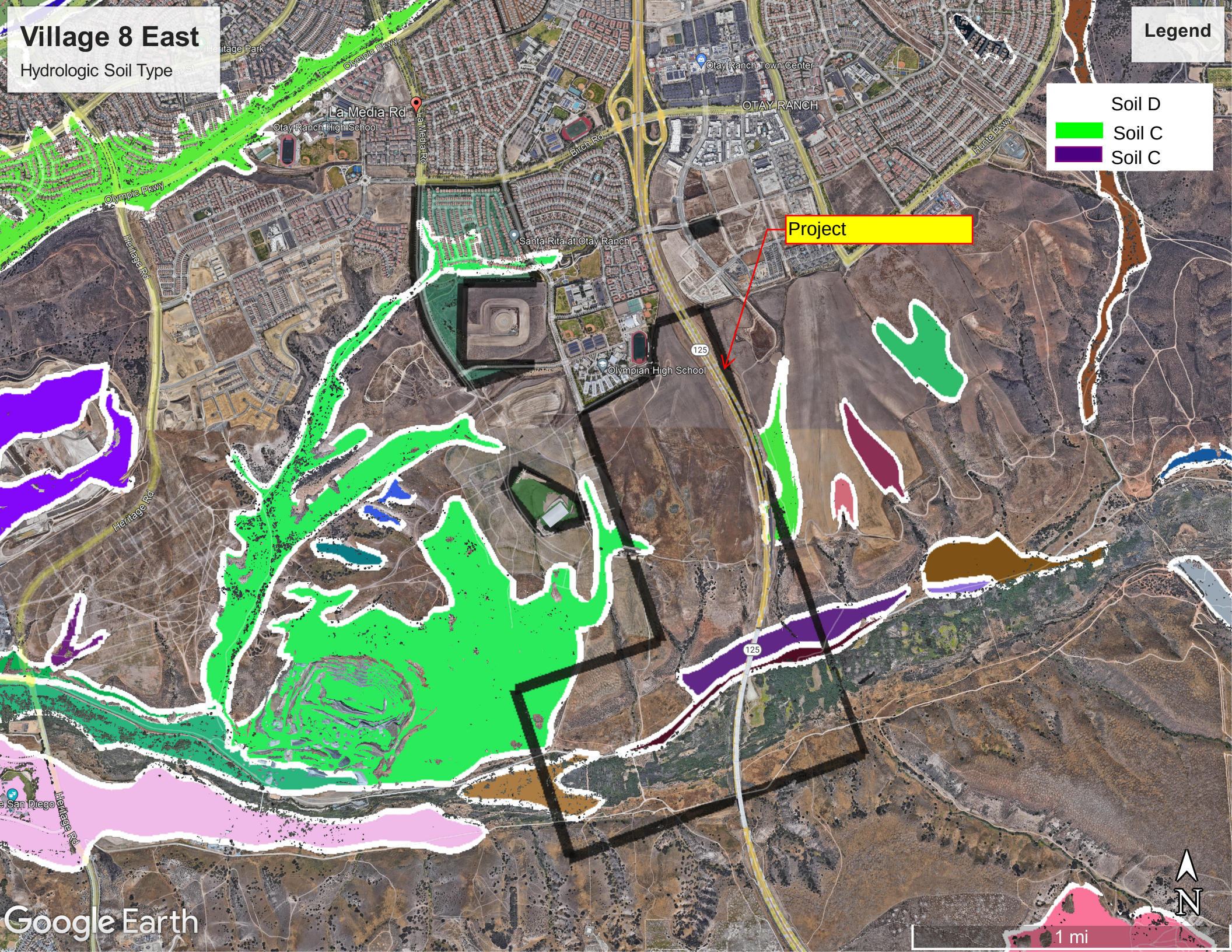
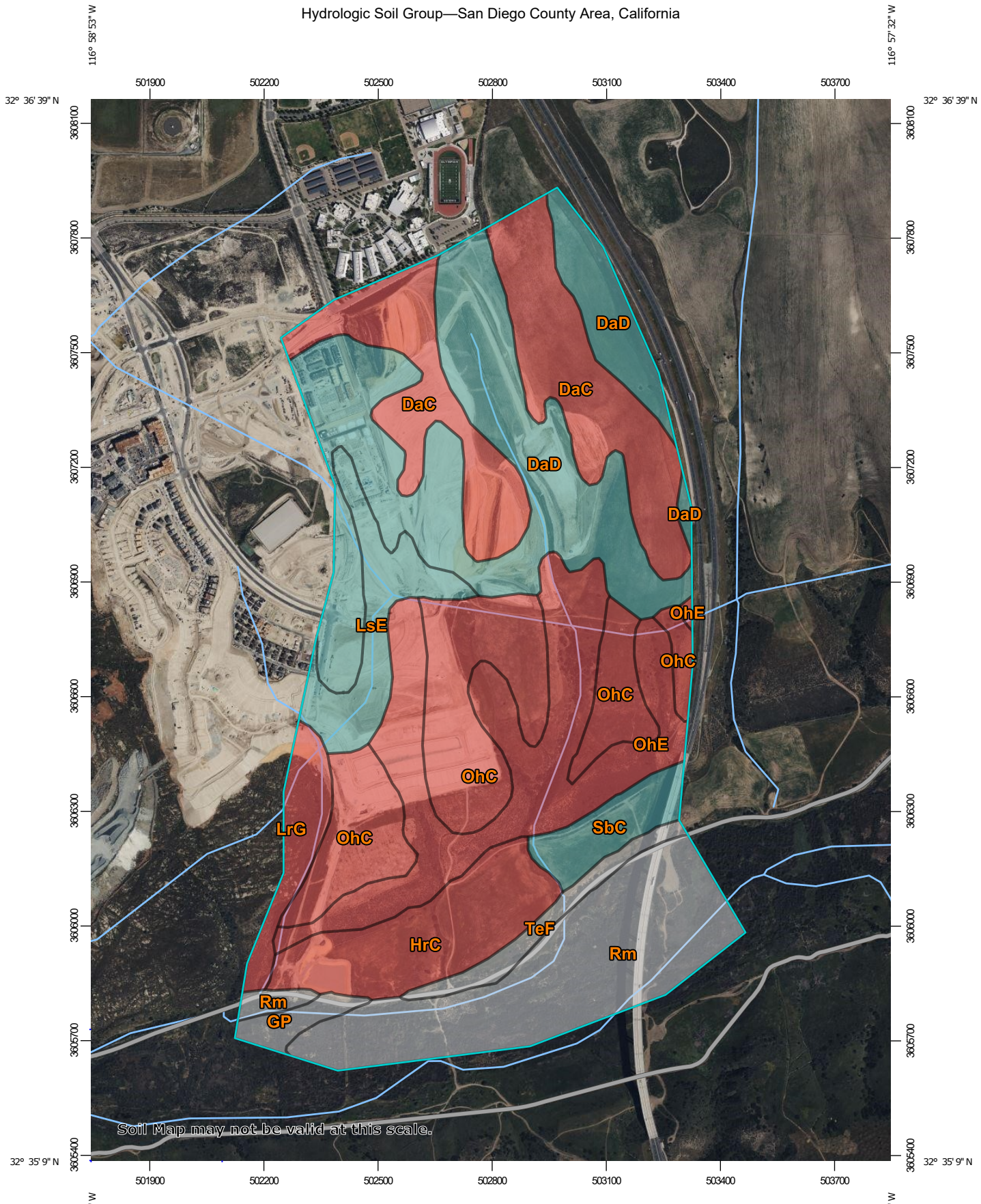

Village 8 East
Hydrologic Soil Type
Legend
Soil D
Soil C
Soil C
Project
Heritage Park
Olympic Pkwy
La Media Rd
Otay Ranch High School
Otay Ranch Town Center
OTAY RANCH
Birch Rd
Hunte Pkwy
Santa Rita at Otay Ranch
Olympian High School
125
Heritage Rd
N
1 mi
Google Earth



Map Scale: 1:13,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 200 400 800 1200

Feet
0 500 1000 2000 3000

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 18, Sep 14, 2022

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

Date(s) aerial images were photographed: Mar 24, 2022—Apr 29, 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
DaC	Diablo clay, 2 to 9 percent slopes	D	80.5	15.4%
DaD	Diablo clay, 9 to 15 percent slopes, warm MAAT	C	120.0	22.9%
GP	Gravel pits		5.7	1.1%
HrC	Huerhuero loam, 2 to 9 percent slopes	D	36.6	7.0%
LrG	Las Posas loam, 30 to 65 percent slopes, stony	D	13.9	2.7%
LsE	Linne clay loam, 9 to 30 percent slopes	C	23.8	4.5%
OhC	Olivenhain cobbly loam, 2 to 9 percent slopes	D	72.6	13.9%
OhE	Olivenhain cobbly loam, 9 to 30 percent slopes	D	76.0	14.5%
Rm	Riverwash		70.8	13.5%
SbC	Salinas clay loam, 2 to 9 percent slopes	C	13.7	2.6%
TeF	Terrace escarpments		9.6	1.8%
Totals for Area of Interest			**523.2**	**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

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.4 – Rainfall Intensity Determination

-Maximum Overland Flow Length & Initial Time of Concentration

-Urban Watershed Overland Time of Flow Nomograph

- Manning's Equation Nomograph

-Intensity-Duration Design Chart

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

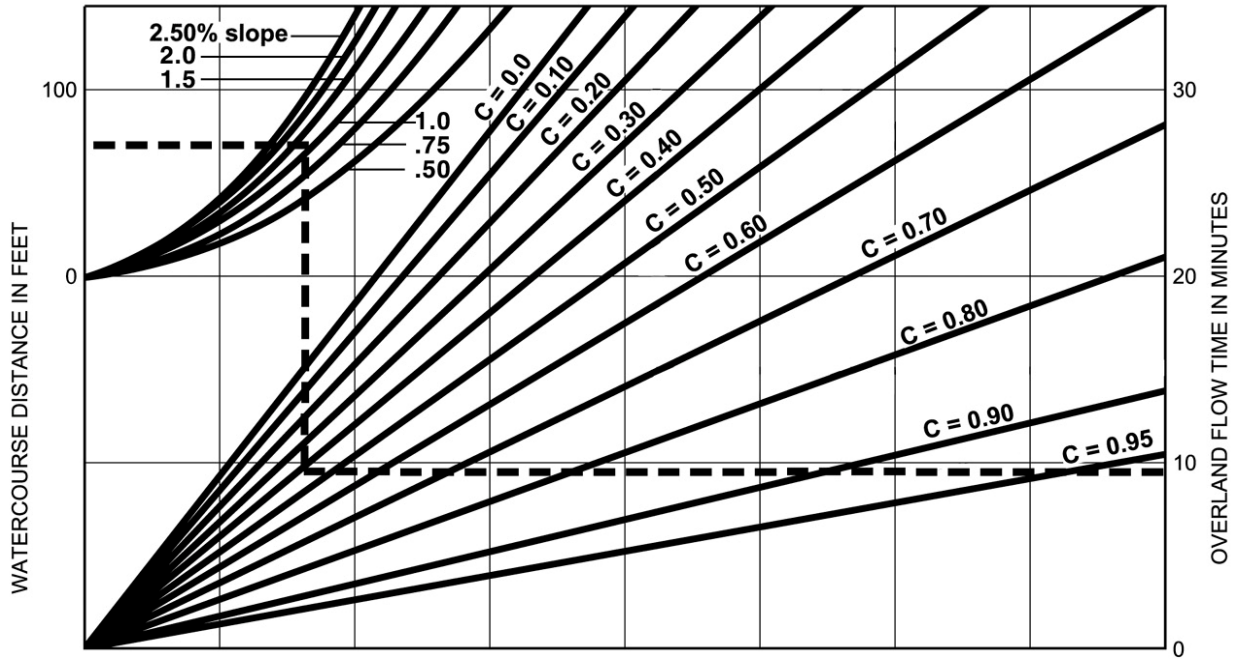
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

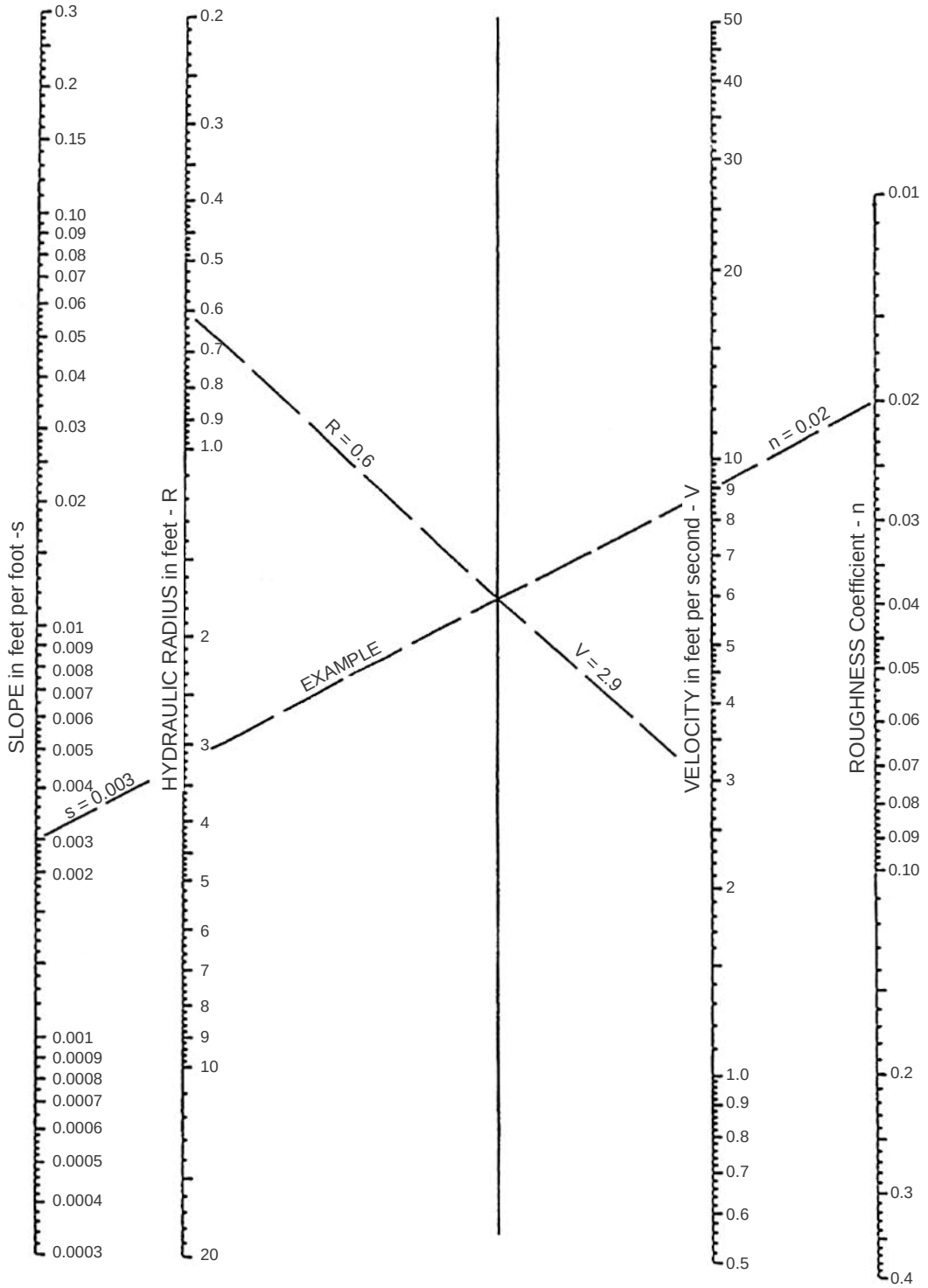
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Rational Formula - Overland Time of Flow Nomograph

FIGURE 3-3

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$

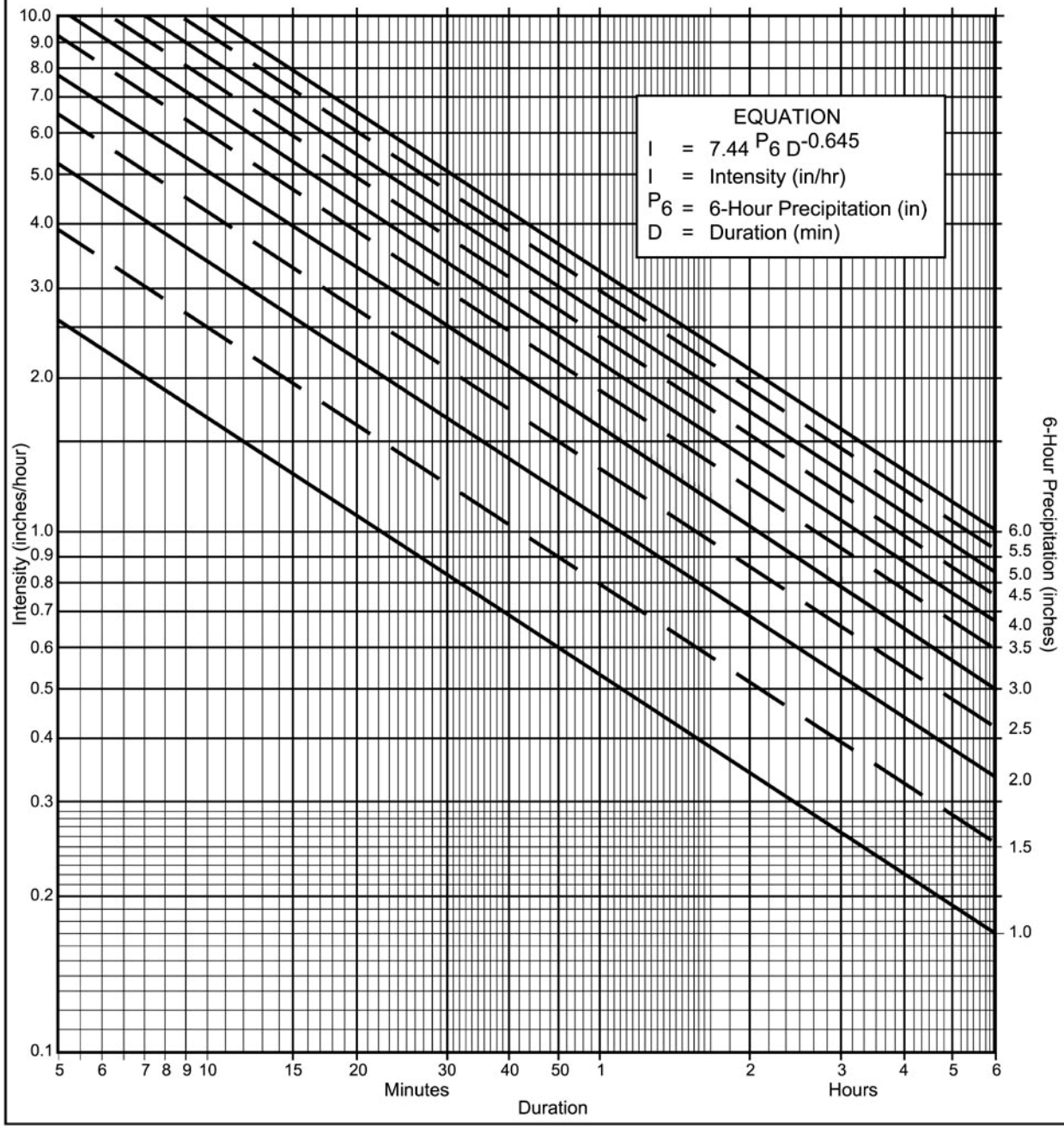


GENERAL SOLUTION

SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE 3-7

Manning's Equation Nomograph



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 50 year

(b) P_6 = 2.15 in., P_{24} = 4.00, $\frac{P_6}{P_{24}} = \frac{2.15}{4.00}$ = 54%(2)

(c) Adjusted P_6(2) = 2.15 in.

(d) t_x = _____ min.

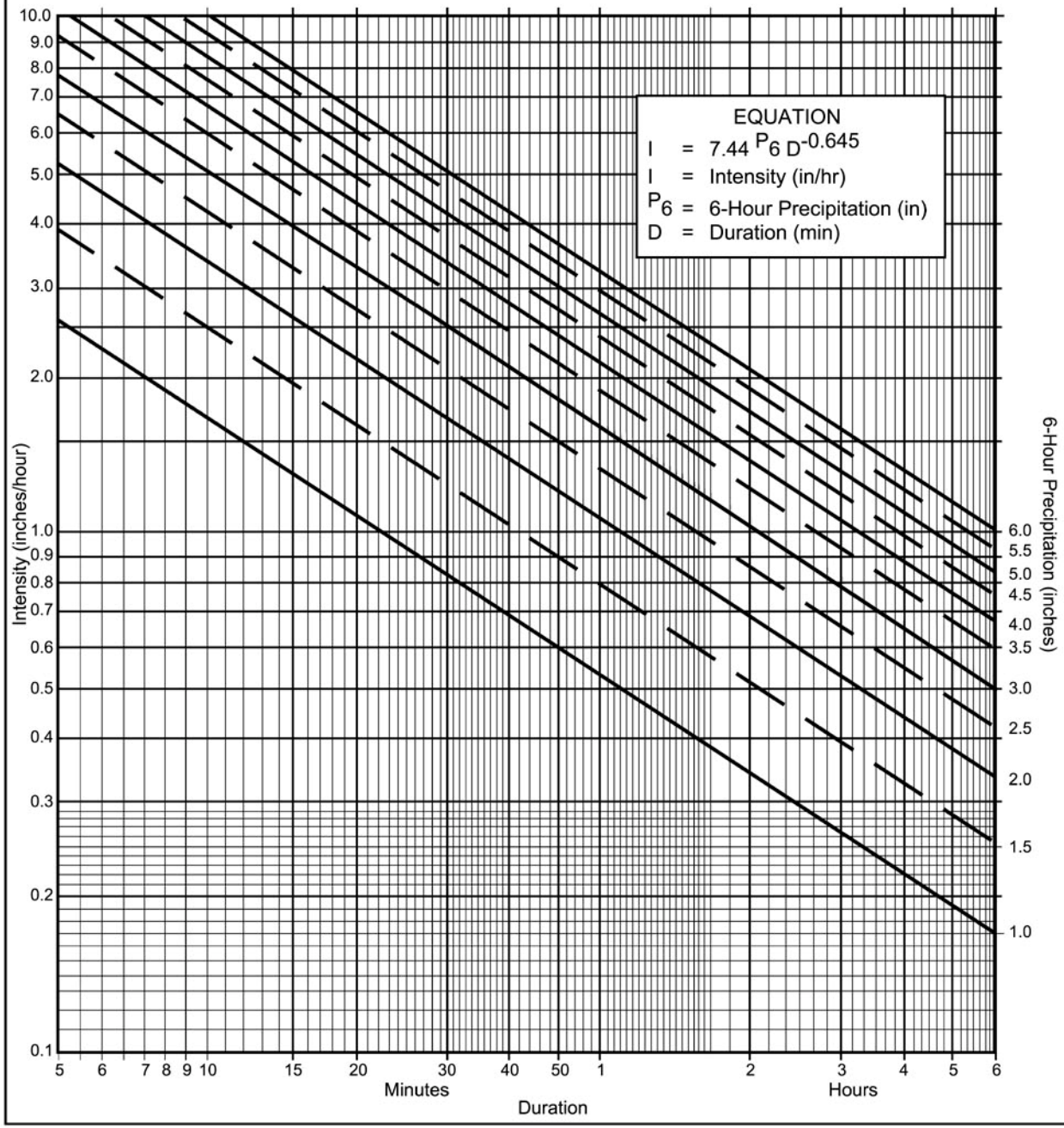
(e) I = _____ in./hr.

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



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 = 2.35 in., P_{24} = 4.25, $\frac{P_6}{P_{24}} = \frac{2.35}{4.25}$ = 55% (2)

(c) Adjusted P_6 (2) = 2.35 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

CHAPTER 2

2.5 – NRCS Unit Hydrograph Hydrologic Analysis

2.6 NRCS Unit Hydrograph Hydrologic Analysis

The Natural Resources Conservation Service (NRCS) Unit Hydrograph is necessary for hydrologic analyses of watershed areas approximately one square mile and greater in size. The HEC-HMS Version 4.5 program was used to produce hydrographs using the NRCS Unit Hydrograph method for this study. HEC-HMS, developed by the United States Army Corps of Engineers' Hydrologic Engineering Center, simulates the surface runoff response of a watershed to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components.

The NRCS Unit Hydrograph calculations and input parameters follow the guidelines in Section 4 of the 2003 San Diego County Hydrology Manual (SDCHM). The input that was required to produce the hydrographs included rainfall depth, rainfall distribution, drainage basin area, precipitation loss data, and data to determine overland and channel routing information. Output from the model is presented in the form of hydrographs, which are curves relating runoff flowrates to elapsed time from the beginning of rainfall. Thus, the distribution of the entire runoff response is available for analysis.

Rainfall Distribution, Duration & Volume

Runoff for this analysis was generated using the County of San Diego's Nested Storm Hyetograph. The amount of rainfall to be distributed was obtained from the County of San Diego's rainfall isopluvial charts, which are located at the end of this section. This analysis models the 100-year return frequency rainfall event.

Rainfall Loss Criteria

To account for rainfall losses such as infiltration, interception and depression storage, the NRCS Curve Number method was selected. The NRCS method calculates the runoff volume and initial loss based on an empirical curve number, which is determined based on a basin's soil type and land use. Soils in this analysis were based on soil groups taken from the NRCS soil website. In most cases throughout this project, soil type group D was found, which is characterized as soils with very low infiltration rates and high runoff potential (typically clay soils).
Based on the 2003 San Diego County Hydrology Manual, the project site is determined to be located in PZN of 1.5. According to Table 4-6 of the SDCHM, an adjusted PZN of 2.5 was used for 100-year analysis. The following curve numbers were selected corresponding to 'weighted' soil types.

PZN = 2.0	Adjusted PZN = 2.5
87	91
81	86.5

To determine the curve number for a basin containing more than one of the preceding land uses, a composite curve number (weighted average) was calculated using a linear interpolation of the values in Table 4-10 from the SDCHM.

Basin Lag Time

Basin lag times were calculated for both existing and developed conditions based on relationships developed by the United States Army Corps of Engineers. The Corps lag time is defined as the elapsed time (in hours) from the beginning of unit effective rainfall to the instant that runoff hydrograph for a basin reaches 50 percent of the ultimate discharge volume. Per equation 4-17 from the County's Hydrology Manual, the lag time for a basin is calculated using the following empirical relationship.

$$\text{Lag Time (hours)} = 24 * n * [(L * L_c)/ ((S)^{1/2})]^{m}$$

n = basin factor
m = constant (0.38)
L = length of longest watercourse in miles
L_c = length along longest watercourse measured upstream to point opposite center of area (miles)
S = overall slope of longest watercourse (feet per mile)

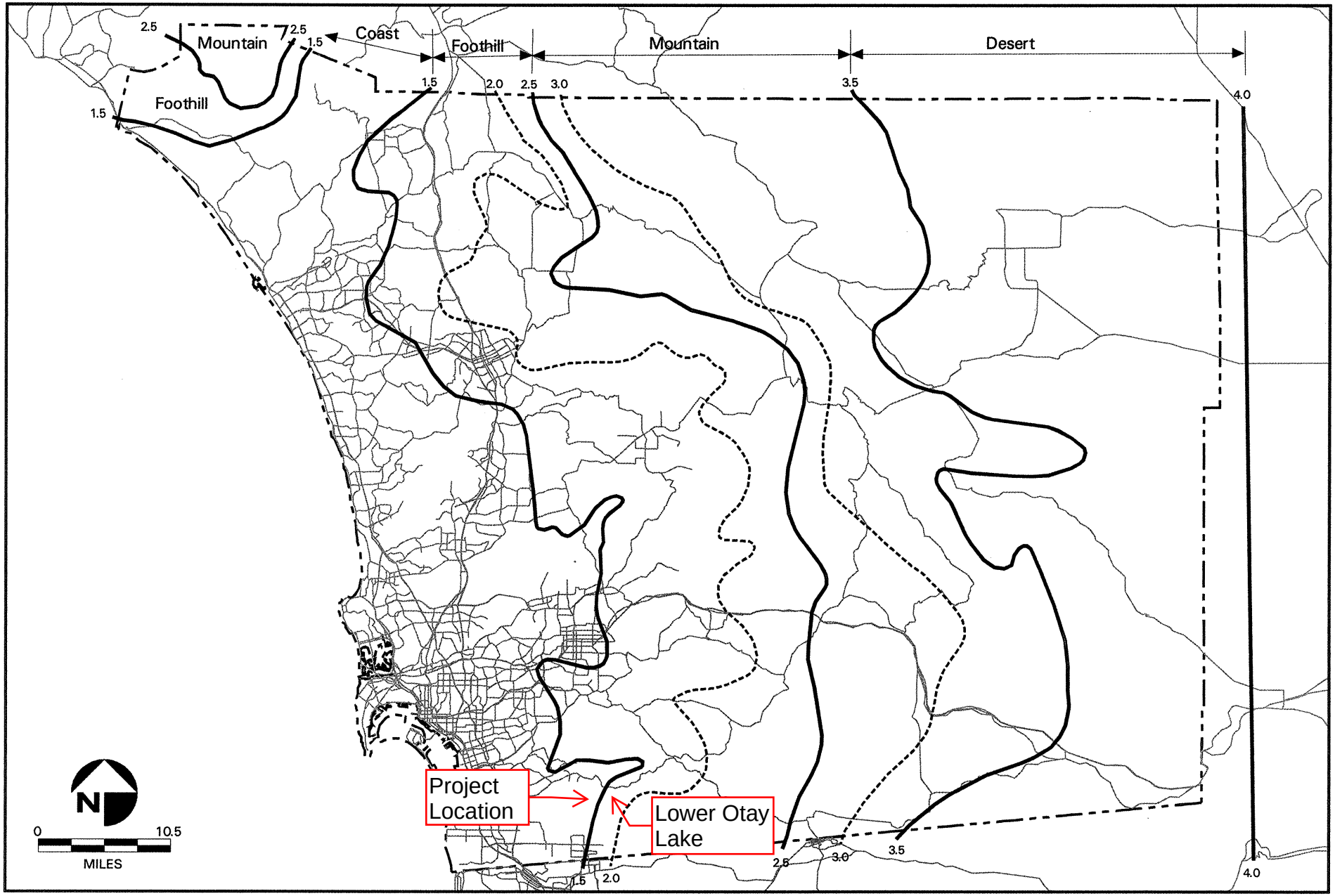
The basin n factor is the visually estimated mean of the Mannings n values for all the channels within an area. Basin n factors are chosen according to the following criteria.

n = 0.100 The drainage area has extensive vegetation and streams that contain a large amount of brush, grass or other vegetation that slows flow velocity

n = 0.050 Drainage area is rugged, with sharp ridges and steep canyons through which watercourses meander around sharp bends, large boulders, and debris obstruction. The ground cover, excluding small areas of rock outcrops, includes considerable underbrush. No drainage improvements exist in the area.

n = 0.030 Drainage area is generally rolling, with rounded edges and moderate side slopes. Watercourses meander in fairly straight, unimproved channels with some boulders and debris. No drainage improvements exist in the area.

n = 0.015 Drainage area has fairly uniform, gentle slopes with most watercourses either improved or along paved streets. Ground cover consists of grass with appreciable areas developed to the extent that a large percentage of the area is impervious.



County of San Diego Hydrology Manual

Precipitation Zone Numbers (PZN)

PZN = 1.5

FIGURE

C-1

Table 4-10

RUNOFF CURVE NUMBERS FOR PZN CONDITIONS 1.0, 2.0, AND 3.0

CN For:			CN For:		
PZN Condition = 1.0	PZN Condition = 2.0	PZN Condition = 3.0	PZN Condition = 1.0	PZN Condition = 2.0	PZN Condition = 3.0
100	100	100	40	60	78
97	99	100	39	59	77
94	98	99	38	58	76
91	97	99	37	57	75
89	96	99	37	56	75
87	95	98	34	55	73
85	94	98	34	54	73
83	93	98	33	53	72
81	92	97	32	52	71
80	91	97	31	51	70
78	90	96	31	50	70
76	89	96	30	49	69
75	88	95	29	48	68
73	87	95	28	47	67
72	86	94	27	46	66
70	85	94	26	45	65
68	84	93	25	44	64
67	83	93	25	43	63
66	82	92	24	42	62
64	81	92	23	41	61
63	80	91	22	40	60
62	79	91	21	39	59
60	78	90	21	38	58
59	77	89	20	37	57
58	76	89	19	36	56
57	75	88	18	35	55
55	74	88	18	34	54
54	73	87	17	33	53
53	72	86	16	32	52
52	71	86	16	31	51
51	70	85	15	30	50
50	69	84			
48	68	84	12	25	43
47	67	83	9	20	37
46	66	82	6	15	30
45	65	82	4	10	22
44	64	81	2	5	13
43	63	80	0	0	0
42	62	79			
41	61	78			

The adjustment for PZN Condition may be made to the composite CN for the watershed. It is not necessary to make the PZN Condition adjustment to each of the CNs for the different combinations of ground cover and soil group within the watershed before calculating the composite CN.

Table 4-6

PZN ADJUSTMENT FACTORS FOR FLOW COMPUTATIONS (San Diego County)

Storm Frequency	Coast (PZN = 1.0)	1.5	Foothills (PZN = 2.0)	Mountains (PZN = 3.0)	Desert (PZN = 4.0)
Less than 35-year return period	1.5		2.5	2.0	1.5
Greater than or equal to 35-year return period	2.0	2.5	3.0	3.0	2.0

Notes: PZN is the precipitation zone number (see Map, Appendix C). The PZN adjustment factor represents the PZN Condition that the CN for the watershed should be adjusted to.

4.1.3 Rainfall-Runoff Relationship

A relationship between accumulated rainfall and accumulated runoff was derived by NRCS from experimental plots for numerous soils and vegetative cover conditions. The following NRCS runoff equation is used to estimate direct runoff from 24-hour or 6-hour storm rainfall. The equation is:

$$Q_a = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad \text{(Eq. 4-1)}$$

where: Q_a = accumulated direct runoff (in)

P = accumulated rainfall (potential maximum runoff) (in)

I_a = initial abstraction including surface storage, interception, evaporation, and infiltration prior to runoff (in)

S = potential maximum soil retention (in)

Table 4-2
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Developing urban areas and newly graded areas (pervious areas only, no vegetation)				77	86	91	94
Impervious areas: Paved parking lots, roofs, and driveways (excluding right-of-way)				98	98	98	98
Residential districts by average lot size:[4]							
1/8 acre or less (town houses)			65%	77	85	90	92
1/4 acre			38%	61	75	83	87
1/3 acre			30%	57	72	81	86
1/2 acre			25%	54	70	80	85
1 acre			20%	51	68	79	84
2 acres			12%	46	65	77	82
Streets and roads	Paved; curbs and storm drains (excluding right-of-way)			98	98	98	98
	Paved; open ditches (including right-of-way)			83	89	92	93
	Gravel (including right-of-way)			76	85	89	91
	Hard surface (including right-of-way)			74	84	90	92
	Dirt (including right-of-way)			72	82	87	89
Urban districts[4]	Commercial and business		85%	89	92	94	95
	Industrial		72%	81	88	91	93
Western desert urban areas:							
Natural desert landscaping (pervious areas only)[5]				63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)				96	96	96	96

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Close-seeded legumes or rotated pasture	Straight row	Poor		66	77	85	89
		Good		58	72	81	85
	Contoured	Poor		64	75	83	85
		Good		55	69	78	83
	Contoured and terraced	Poor		63	73	80	83
		Good		51	67	76	80
Cultivated land	Without conservation treatment			72	81	88	91
	With conservation treatment			62	71	78	81
Fallow	Bare soil			77	86	91	94
	Crop residue cover	Poor		76	85	90	92
		Good		74	83	88	90
Farmsteads (buildings, lanes, driveways, and surrounding lots)				59	74	82	86
Irrigated pasture		Poor		58	74	83	87
		Fair		44	65	77	82
		Good		33	58	72	79
Orchards (deciduous)			(see glossary description)				
Orchards (evergreen)		Poor		57	73	82	86
		Fair		44	65	77	82
		Good		33	58	72	79
Row crops	Straight row	Poor		72	81	88	91
		Good		67	78	85	89
	Contoured	Poor		70	79	84	88
		Good		65	75	82	86

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Small grain	Straight row	Poor		65	76	84	88
		Good		63	75	83	87
	Contoured	Poor		63	74	82	85
		Good		61	73	81	84
Vineyards[6]	Disked			76	85	90	92
	Annual grass or legume cover	Poor		65	78	85	89
		Fair		50	69	79	84
		Good		38	61	74	80
Annual grass (Dryland pasture)		Poor		67	78	86	89
		Fair		50	69	79	84
		Good		38	61	74	80
Barren				78	86	91	93
Meadow		Poor		63	77	85	88
		Fair		51	70	80	84
		Good		30	58	72	78
Open space (lawns, parks, golf courses, cemeteries, etc.)[7]	Grass cover <50%	Poor		68	79	86	89
	Grass cover 50% to 75%	Fair		49	69	79	84
	Grass cover >75%	Good		39	61	74	80
Pasture or range land		Poor		68	79	86	89
		Fair		49	69	79	84
		Good		39	61	74	80
Perennial grass		Poor		67	79	86	89
		Fair		50	69	79	84
		Good		38	61	74	80

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Turf[8]		Poor		58	74	83	87
		Fair		44	65	77	82
		Good		33	58	72	79
Water surfaces (during floods)				97	98	99	99
Broadleaf chaparral		Poor		53	70	80	85
		Fair		40	63	75	81
		Good		31	57	71	78
Desert shrub–major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus		Poor		63	77	85	88
		Fair		55	72	81	86
		Good		49	68	79	84
Herbaceous–mixture of grass, weeds, and low-growing brush, with brush the minor element		Poor		[9]	80	87	93
		Fair		[9]	71	81	89
		Good		[9]	62	74	85
Narrowleaf chaparral		Poor		71	82	88	91
		Fair		55	72	81	86
Oak-aspen–mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush		Poor		[9]	66	74	79
		Fair		[9]	48	57	63
		Good		[9]	30	41	48
Open brush		Poor		62	76	84	88
		Fair		46	66	77	83
		Good		41	63	75	81

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Pinyon-juniper–pinyon, juniper, or both; grass understory		Poor		[9]	75	85	89
		Fair		[9]	58	73	80
		Good		[9]	41	61	71
Sagebrush with grass understory		Poor		[9]	67	80	85
		Fair		[9]	51	63	70
		Good		[9]	35	47	55
Wood or forest land		Thin stand, poor cover		45	66	77	83
		Good cover		25	55	70	77
Woods (woodland)		Poor		45	66	77	83
		Fair		36	60	73	79
		Good		28	55	70	77
Woodland-grass combination		Poor		57	73	82	86
		Fair		44	65	77	82
		Good		33	58	72	79

[1] Average runoff condition, and $I_a = 0.2S$.
[2] Hydrologic practices described as "straight row" and "contoured" are defined in the glossary.
[3] For definition of hydrologic condition, see Tables 4-3, 4-4, and 4-5.
[4] The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. If the impervious area is not directly connected, the NRCS method has an adjustment to reduce the effect.
[5] Composite CNs for natural desert landscaping should be computed based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.
[6] See glossary.
[7] CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.
[8] Includes lawns, cemeteries, golf courses and parks with ground cover of mowed and irrigated perennial grass.
[9] CNs for Group A have not been developed.

Table 4-3

CLASSIFICATION OF NATIVE PASTURE OR RANGE

Vegetative Condition	Hydrologic Condition
Heavily grazed. Has no mulch or has plant cover on less than 50% of the area.	Poor
Not heavily grazed. Has plant cover on 50% to 75% of the area.	Fair
Lightly grazed. Has plant cover on more than 75% of the area.	Good

Table 4-4

AIR-DRY WEIGHT CLASSIFICATION OF NATIVE PASTURE OR RANGE

	Plant and litter air-dry weight (tons per acre):		
Cover density	Less than 0.5	0.5 to 1.5	More than 1.5
Less than 50%	Poor	Poor+	Fair
50% to 75%	Poor+	Fair	Fair+
More than 75%	Fair	Fair+	Good

Table 4-5

CLASSIFICATION OF WOODS

Vegetative Condition	Hydrologic Condition
Heavily grazed or regularly burned. Litter, small trees, and brush are destroyed.	Poor
Grazed but not burned. There may be some litter but these woods are not protected.	Fair
Protected from grazing. Litter and shrubs cover the soil.	Good

CHAPTER 3

HYDROLOGIC ANALYSIS

3.1 – 100-Year Pre-Developed Condition AES Model Output

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****************************************************************************

            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 *************************
* Otay Ranch, Village 8 TM Hydrology Study                              *
* 100-year return interval, Existing Condition                          *
* W.O. 2825-03,  DLN 920                                                *
 ************************************************************************

  FILE NAME: R:\0920\HYD\TM\DR\CALCS\AES\100EX.DAT
  TIME/DATE OF STUDY: 13:39 07/03/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.350
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  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   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   16.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    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 =  0.50 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    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    330.00
  DOWNSTREAM ELEVATION(FEET) =    320.00
  ELEVATION DIFFERENCE(FEET) =     10.00
```

```
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    320.00  DOWNSTREAM(FEET) =    260.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00   CHANNEL SLOPE =  0.0759
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.964
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.74
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.60
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   2.86
  Tc(MIN.) =    7.04
  SUBAREA AREA(ACRES) =     9.33       SUBAREA RUNOFF(CFS) =   23.16
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.502
  TOTAL AREA(ACRES) =        9.6         PEAK FLOW RATE(CFS) =      23.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   5.57
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     890.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    260.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   745.00   CHANNEL SLOPE =  0.0805
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.259
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      38.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.58
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   1.89
  Tc(MIN.) =    8.93
  SUBAREA AREA(ACRES) =    13.83       SUBAREA RUNOFF(CFS) =   29.45
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.501
  TOTAL AREA(ACRES) =       23.4         PEAK FLOW RATE(CFS) =      49.91

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =   7.11
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    104.00 =    1635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.93
  RAINFALL INTENSITY(INCH/HR) =   4.26
  TOTAL STREAM AREA(ACRES) =    23.39
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     49.91

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     76.00 IS CODE =   7
```

```
--------------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
================================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  21.39   RAIN INTENSITY(INCH/HOUR) =  2.42
  TOTAL AREA(ACRES) =   181.20   TOTAL RUNOFF(CFS) =    347.24

********************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE     76.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.425
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7838
  SUBAREA AREA(ACRES) =    4.17   SUBAREA RUNOFF(CFS) =    5.06
  TOTAL AREA(ACRES) =      185.4   TOTAL RUNOFF(CFS) =     352.30
  TC(MIN.) =   21.39

********************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE     76.00 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.) =   21.39
  RAINFALL INTENSITY(INCH/HR) =   2.42
  TOTAL STREAM AREA(ACRES) =   185.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    352.30

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       49.91     8.93        4.259         23.39
      2      352.30    21.39        2.425        185.37

  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      196.99     8.93       4.259
      2      380.71    21.39       2.425

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     380.71   Tc(MIN.) =   21.39
  TOTAL AREA(ACRES) =      208.8
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE     76.00 =    1635.00 FEET.

+------------------------------------------------------------------------------+
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********************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    340.00
  DOWNSTREAM ELEVATION(FEET) =    300.00
  ELEVATION DIFFERENCE(FEET) =     40.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.484
```

```
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.90
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      0.90

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    300.00  DOWNSTREAM(FEET) =    240.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   763.00   CHANNEL SLOPE =  0.0786
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.929
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.82
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   2.64
  Tc(MIN.) =    7.12
  SUBAREA AREA(ACRES) =    10.84       SUBAREA RUNOFF(CFS) =   26.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       11.1         PEAK FLOW RATE(CFS) =      27.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   5.89
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     843.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    240.00  DOWNSTREAM(FEET) =    202.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   975.00   CHANNEL SLOPE =  0.0390
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.906
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      41.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.26
  AVERAGE FLOW DEPTH(FEET) =   0.52   TRAVEL TIME(MIN.) =   3.09
  Tc(MIN.) =   10.21
  SUBAREA AREA(ACRES) =    14.81       SUBAREA RUNOFF(CFS) =   28.92
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       25.9         PEAK FLOW RATE(CFS) =      50.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.58   FLOW VELOCITY(FEET/SEC.) =   5.49
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =    1818.00 FEET.

+----------------------------------------------------------------------------+
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+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    581.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    576.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.316
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.325
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    576.00  DOWNSTREAM(FEET) =    502.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   725.00   CHANNEL SLOPE =  0.1021
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.303
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.42
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.89
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   2.47
  Tc(MIN.) =    8.79
  SUBAREA AREA(ACRES) =     9.84       SUBAREA RUNOFF(CFS) =   21.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       10.1         PEAK FLOW RATE(CFS) =      21.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   5.94
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     825.00 FEET.

+--------------------------------------------------------------------------+
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|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    556.00
  DOWNSTREAM ELEVATION(FEET) =    550.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.944
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.538
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    550.00  DOWNSTREAM(FEET) =    416.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1194.00   CHANNEL SLOPE =  0.1122
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.022
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.22
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   3.81
  Tc(MIN.) =    9.76
```

```
  SUBAREA AREA(ACRES) =    11.93       SUBAREA RUNOFF(CFS) =   23.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       12.1         PEAK FLOW RATE(CFS) =      24.36

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   6.38
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =    1294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   418.00  DOWNSTREAM(FEET) =   408.00
  FLOW LENGTH(FEET) =   531.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.48
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.36
  PIPE TRAVEL TIME(MIN.) =   0.84    Tc(MIN.) =   10.60
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =    1825.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.813
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5000
  SUBAREA AREA(ACRES) =    2.15   SUBAREA RUNOFF(CFS) =    4.10
  TOTAL AREA(ACRES) =       14.3   TOTAL RUNOFF(CFS) =      27.18
  TC(MIN.) =   10.60

+----------------------------------------------------------------------------+
|                                                                            |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    470.00
  DOWNSTREAM ELEVATION(FEET) =    460.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.013
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.181
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    470.00  DOWNSTREAM(FEET) =    360.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1196.00   CHANNEL SLOPE =  0.0920
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.237
  *USER SPECIFIED(SUBAREA):
```

```
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.00
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   3.99
  Tc(MIN.) =    9.00
  SUBAREA AREA(ACRES) =    12.53       SUBAREA RUNOFF(CFS) =   26.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       12.7         PEAK FLOW RATE(CFS) =      26.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOW VELOCITY(FEET/SEC.) =   6.11
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1296.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    360.00  DOWNSTREAM(FEET) =    260.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1397.00   CHANNEL SLOPE =  0.0716
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.377
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      36.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.13
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   3.80
  Tc(MIN.) =   12.80
  SUBAREA AREA(ACRES) =    10.69       SUBAREA RUNOFF(CFS) =   18.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       23.4         PEAK FLOW RATE(CFS) =      39.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.43   FLOW VELOCITY(FEET/SEC.) =   6.39
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    503.00 =    2693.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    503.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.80
  RAINFALL INTENSITY(INCH/HR) =   3.38
  TOTAL STREAM AREA(ACRES) =    23.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     39.51

****************************************************************************
  FLOW PROCESS FROM NODE    505.00 TO NODE    506.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =    609.70
  DOWNSTREAM ELEVATION(FEET) =    607.00
  ELEVATION DIFFERENCE(FEET) =      2.70
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.104
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.936
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    506.00 TO NODE    507.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    607.00  DOWNSTREAM(FEET) =    508.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   719.00   CHANNEL SLOPE =  0.1377
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.016
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.47
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.68
  Tc(MIN.) =    9.78
  SUBAREA AREA(ACRES) =     6.50       SUBAREA RUNOFF(CFS) =   13.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =        6.6         PEAK FLOW RATE(CFS) =      13.23

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   5.66
  LONGEST FLOWPATH FROM NODE    505.00 TO NODE    507.00 =     809.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    507.00 TO NODE    508.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    508.00  DOWNSTREAM(FEET) =    430.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1122.00   CHANNEL SLOPE =  0.0695
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.366
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.07
  AVERAGE FLOW DEPTH(FEET) =   0.40   TRAVEL TIME(MIN.) =   3.08
  Tc(MIN.) =   12.86
  SUBAREA AREA(ACRES) =    24.80       SUBAREA RUNOFF(CFS) =   41.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       31.4         PEAK FLOW RATE(CFS) =      52.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =   6.89
  LONGEST FLOWPATH FROM NODE    505.00 TO NODE    508.00 =    1931.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    508.00 TO NODE    509.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    430.00  DOWNSTREAM(FEET) =    370.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1040.00   CHANNEL SLOPE =  0.0577
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.012
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      77.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.15
  AVERAGE FLOW DEPTH(FEET) =   0.65   TRAVEL TIME(MIN.) =   2.42
  Tc(MIN.) =   15.29
  SUBAREA AREA(ACRES) =    32.42       SUBAREA RUNOFF(CFS) =   48.82
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       63.8         PEAK FLOW RATE(CFS) =      96.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.73   FLOW VELOCITY(FEET/SEC.) =   7.61
  LONGEST FLOWPATH FROM NODE    505.00 TO NODE    509.00 =    2971.00 FEET.

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

```
 FLOW PROCESS FROM NODE    509.00 TO NODE    510.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    370.00  DOWNSTREAM(FEET) =    328.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   900.00   CHANNEL SLOPE =  0.0467
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.783
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     124.92
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.55
 AVERAGE FLOW DEPTH(FEET) =   0.88   TRAVEL TIME(MIN.) =   1.99
 Tc(MIN.) =   17.27
 SUBAREA AREA(ACRES) =    41.43       SUBAREA RUNOFF(CFS) =   57.65
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
 TOTAL AREA(ACRES) =      105.2         PEAK FLOW RATE(CFS) =     146.45

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.95   FLOW VELOCITY(FEET/SEC.) =   7.92
 LONGEST FLOWPATH FROM NODE    505.00 TO NODE    510.00 =    3871.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    510.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    328.00  DOWNSTREAM(FEET) =    260.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1540.00   CHANNEL SLOPE =  0.0442
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.494
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     164.58
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.02
 AVERAGE FLOW DEPTH(FEET) =   1.02   TRAVEL TIME(MIN.) =   3.20
 Tc(MIN.) =   20.47
 SUBAREA AREA(ACRES) =    29.07       SUBAREA RUNOFF(CFS) =   36.25
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
 TOTAL AREA(ACRES) =      134.3         PEAK FLOW RATE(CFS) =     167.49

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.03   FLOW VELOCITY(FEET/SEC.) =   8.04
 LONGEST FLOWPATH FROM NODE    505.00 TO NODE    503.00 =    5411.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    503.00 TO NODE    503.00 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.) =   20.47
 RAINFALL INTENSITY(INCH/HR) =   2.49
 TOTAL STREAM AREA(ACRES) =   134.31
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    167.49

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       39.51    12.80        3.377         23.40
     2      167.49    20.47        2.494        134.31

 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      144.20    12.80       3.377
      2      196.67    20.47       2.494

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     196.67   Tc(MIN.) =   20.47
  TOTAL AREA(ACRES) =      157.7
  LONGEST FLOWPATH FROM NODE    505.00 TO NODE    503.00 =    5411.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    511.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    260.00  DOWNSTREAM(FEET) =    210.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1096.00   CHANNEL SLOPE =  0.0456
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.341
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     209.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.67
  AVERAGE FLOW DEPTH(FEET) =   1.13   TRAVEL TIME(MIN.) =   2.11
  Tc(MIN.) =   22.58
  SUBAREA AREA(ACRES) =    22.61       SUBAREA RUNOFF(CFS) =   26.47
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =      180.3         PEAK FLOW RATE(CFS) =     211.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.14   FLOW VELOCITY(FEET/SEC.) =   8.66
  LONGEST FLOWPATH FROM NODE    505.00 TO NODE    511.00 =    6507.00 FEET.

+----------------------------------------------------------------------------+
|                                                                            |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    550.00 TO NODE    551.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    374.00
  DOWNSTREAM ELEVATION(FEET) =    364.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    551.00 TO NODE    552.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    364.00  DOWNSTREAM(FEET) =    212.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1442.00   CHANNEL SLOPE =  0.1054
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.575
```

```
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      24.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.30
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   3.82
  Tc(MIN.) =    7.99
  SUBAREA AREA(ACRES) =    19.83       SUBAREA RUNOFF(CFS) =   45.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.501
  TOTAL AREA(ACRES) =       20.0         PEAK FLOW RATE(CFS) =      45.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   7.61
  LONGEST FLOWPATH FROM NODE    550.00 TO NODE    552.00 =    1542.00 FEET.

+------------------------------------------------------------------------+
|                                                                        |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    609.00
  DOWNSTREAM ELEVATION(FEET) =    606.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.893
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    606.00  DOWNSTREAM(FEET) =    551.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1254.00   CHANNEL SLOPE =  0.0439
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.541
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.99
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   7.00
  Tc(MIN.) =   11.89
  SUBAREA AREA(ACRES) =     5.97       SUBAREA RUNOFF(CFS) =   10.57
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =        6.1         PEAK FLOW RATE(CFS) =      10.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   3.62
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =    1314.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    607.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   553.00  DOWNSTREAM(FEET) =   541.00
  FLOW LENGTH(FEET) =   418.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.0 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.10
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.85
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =   12.58
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    607.00 =    1732.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    607.00 TO NODE    607.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.58
  RAINFALL INTENSITY(INCH/HR) =   3.41
  TOTAL STREAM AREA(ACRES) =     6.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.85

****************************************************************************
  FLOW PROCESS FROM NODE    605.00 TO NODE    606.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    81.00
  UPSTREAM ELEVATION(FEET) =    558.59
  DOWNSTREAM ELEVATION(FEET) =    555.87
  ELEVATION DIFFERENCE(FEET) =      2.72
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.786
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.93
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.93

****************************************************************************
  FLOW PROCESS FROM NODE    606.00 TO NODE    607.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  555.87  DOWNSTREAM ELEVATION(FEET) =  546.96
  STREET LENGTH(FEET) =   345.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  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 =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.01
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.83
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.35
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   1.72   Tc(MIN.) =    5.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.821
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    4.15
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       5.02

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  10.99
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
```

```
 LONGEST FLOWPATH FROM NODE    605.00 TO NODE    607.00 =     426.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    607.00 TO NODE    607.00 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.) =    5.50
 RAINFALL INTENSITY(INCH/HR) =   5.82
 TOTAL STREAM AREA(ACRES) =     1.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.02

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       10.85    12.58        3.415          6.13
     2        5.02     5.50        5.821          1.15

 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        9.77     5.50       5.821
     2       13.80    12.58       3.415

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      13.80   Tc(MIN.) =   12.58
 TOTAL AREA(ACRES) =        7.3
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    607.00 =    1732.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    607.00 TO NODE    612.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   541.00  DOWNSTREAM(FEET) =   522.00
 FLOW LENGTH(FEET) =   596.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  10.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.20
 GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.80
 PIPE TRAVEL TIME(MIN.) =   0.89    Tc(MIN.) =   13.47
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    612.00 =    2328.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    612.00 TO NODE    612.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.47
 RAINFALL INTENSITY(INCH/HR) =   3.27
 TOTAL STREAM AREA(ACRES) =     7.28
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.80

****************************************************************************
 FLOW PROCESS FROM NODE    610.00 TO NODE    611.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .7500
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    546.96
```

```
  DOWNSTREAM ELEVATION(FEET) =    544.56
  ELEVATION DIFFERENCE(FEET) =      2.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.703
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.11
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      1.11

****************************************************************************
  FLOW PROCESS FROM NODE    611.00 TO NODE    612.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  544.56  DOWNSTREAM ELEVATION(FEET) =  527.58
  STREET LENGTH(FEET) =   526.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  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 =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.39
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.35
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.54
  STREET FLOW TRAVEL TIME(MIN.) =   2.01   Tc(MIN.) =    5.72
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.679
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.36      SUBAREA RUNOFF(CFS) =   10.05
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =      11.07

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.51
  FLOW VELOCITY(FEET/SEC.) =  4.98   DEPTH*VELOCITY(FT*FT/SEC.) =   2.07
  LONGEST FLOWPATH FROM NODE    610.00 TO NODE    612.00 =     601.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    612.00 TO NODE    612.00 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.) =    5.72
  RAINFALL INTENSITY(INCH/HR) =   5.68
  TOTAL STREAM AREA(ACRES) =     2.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.07

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.80    13.47        3.268          7.28
      2       11.07     5.72        5.679          2.60

  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       19.02     5.72       5.679
      2       20.17    13.47       3.268

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.17   Tc(MIN.) =   13.47
  TOTAL AREA(ACRES) =        9.9
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    612.00 =    2328.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    613.00 TO NODE    612.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.268
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6383
  SUBAREA AREA(ACRES) =    3.84   SUBAREA RUNOFF(CFS) =    9.41
  TOTAL AREA(ACRES) =       13.7   TOTAL RUNOFF(CFS) =      28.62
  TC(MIN.) =   13.47

+--------------------------------------------------------------------------+
|                                                                          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    609.00
  DOWNSTREAM ELEVATION(FEET) =    606.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.893
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.71
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      0.71

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    606.00  DOWNSTREAM(FEET) =    470.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1571.00   CHANNEL SLOPE =  0.0866
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.045
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.07
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.48
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   4.78
  Tc(MIN.) =    9.67
  SUBAREA AREA(ACRES) =    18.40       SUBAREA RUNOFF(CFS) =   37.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       18.6         PEAK FLOW RATE(CFS) =      37.68

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.40   FLOW VELOCITY(FEET/SEC.) =   6.70
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    702.00 =    1631.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    703.00 IS CODE =  51
```

```
------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    470.00  DOWNSTREAM(FEET) =    423.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1313.00   CHANNEL SLOPE =  0.0358
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.226
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      52.37
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.39
  AVERAGE FLOW DEPTH(FEET) =   0.61   TRAVEL TIME(MIN.) =   4.06
  Tc(MIN.) =   13.74
  SUBAREA AREA(ACRES) =    18.12       SUBAREA RUNOFF(CFS) =   29.23
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       36.8         PEAK FLOW RATE(CFS) =      59.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.64   FLOW VELOCITY(FEET/SEC.) =   5.60
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    703.00 =    2944.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    703.00 TO NODE    704.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    423.00  DOWNSTREAM(FEET) =    375.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   862.00   CHANNEL SLOPE =  0.0557
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.939
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      64.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.74
  AVERAGE FLOW DEPTH(FEET) =   0.60   TRAVEL TIME(MIN.) =   2.13
  Tc(MIN.) =   15.87
  SUBAREA AREA(ACRES) =     7.29       SUBAREA RUNOFF(CFS) =   10.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       44.0         PEAK FLOW RATE(CFS) =      64.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.60   FLOW VELOCITY(FEET/SEC.) =   6.74
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    704.00 =    3806.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    705.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   375.00  DOWNSTREAM(FEET) =   335.00
  FLOW LENGTH(FEET) =   874.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.74
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      64.73
  PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =   16.65
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    705.00 =    4680.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    705.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.850
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5146
  SUBAREA AREA(ACRES) =    7.50   SUBAREA RUNOFF(CFS) =   12.83
  TOTAL AREA(ACRES) =       51.5   TOTAL RUNOFF(CFS) =      75.59
  TC(MIN.) =   16.65

+---------------------------------------------------------------------------+
|                                                                           |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    429.00
  DOWNSTREAM ELEVATION(FEET) =    420.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.192
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.043
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    802.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    420.00  DOWNSTREAM(FEET) =    270.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1518.00   CHANNEL SLOPE =  0.0988
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.905
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.03
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   5.03
  Tc(MIN.) =   10.22
  SUBAREA AREA(ACRES) =    13.12       SUBAREA RUNOFF(CFS) =   25.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       13.3         PEAK FLOW RATE(CFS) =      25.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   6.24
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    802.00 =    1618.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       13.3  TC(MIN.) =     10.22
  PEAK FLOW RATE(CFS)   =      25.93
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 3

HYDROLOGIC ANALYSIS

3.2 – 100-Year Developed Condition AES Model Output

AES INPUT DATA														
Node #		Code	Elevation		Length	Slope	Area	Soil Type	Land cover	C value	If Channel			If memory
From	To		Up	Down			total				Base (ft)	Z:1	maning	Bank #
101	102	2	574.8	574.1	65	1.08%	0.13	C/D	Dense Residential	0.75				
102	103	3	563.1	554.15	1100	0.81%								
102	103	8					8.66	C/D	Dense Residential	0.75				
103	106	3	554.15	551.8	470	0.50%								
106	106	1												2:1
104	105	2	572.3	571.2	64	1.72%	0.18	D	Roads (88% imp)	0.85	C=0.45 for landscape			
105	106	6	571.2	560	900	1.24%	3.42	D	Roads (88% imp)	0.85	C=0.45 for landscape			
106	106	1												2:2
106	110	3	551.8	490.17	1110	5.55%								
110	110	1												2:1
107	108	2	559.6	557.05	80	3.19%	0.14	D	Roads (88% imp)	0.85	C=0.45 for landscape			
108	110	6	557.05	495	834	7.44%	1.59	D	Roads (88% imp)	0.85	C=0.45 for landscape			
110	110	1												2:2
110	124	3	487	480.8	152	4.08%								
124	124	10												1
112	114	2	518	516.5	75	2.00%	0.20	D	Dense Residential	0.75				
114	116	3	505	489	800	2.00%								
114	116	8					9.39	D	Dense Residential	0.75				
113	116	8					1.38	D	Slopes	0.60				
116	122	3	489	482	560	1.25%								
122	122	1												3:1
118	120	2	503.9	503.1	60	1.33%	0.24	D	Roads (88% imp)	0.85	C=0.45 for landscape			
120	122	6	503.1	493	750	1.35%	2.01	D	Roads (88% imp)	0.85	C=0.45 for landscape			
122	122	1												3:2
123	126	2	516	514.5	75	2.00%	0.17	D	Dense Residential	0.75				
126	122	3	503	482	890	2.36%								
126	122	8					9.63	D	Dense Residential	0.75				
125	122	8					1.29	D	Slopes	0.60				
122	122	1												3:3
122	124	3	482	480.8	120	1.00%								
124	124	11												1
124	124	12												1
124	127	3	480.8	468	344	3.72%								
127	127	1												2:1
128	130	2	501	490.5	100	10.50%	0.22	D	Dense Residential	0.75				
130	127	3	479.5	468	1068	1.08%								
130	127	8					10.06	D	Dense Residential	0.75				
127	127	1												2:2
127	132	3	468	456	400	3.00%								
132	132	1												2:1
134	136	2	493.4	490	84	4.05%	0.18	D	Roads (88% imp)	0.85	C=0.45 for landscape			
136	132	6	490	468	700	3.14%	1.67	D	Roads (88% imp)	0.85	C=0.45 for landscape			
132	132	1												2:2
132	154	3	456	453.8	100	2.20%								
154	154	10												1
138	140	2	485	483.5	75	2.00%	0.17	D	Dense Residential	0.75				
140	141	3	482.5	470	600	2.08%								
140	141	8					5.56	D	Dense Residential	0.75				
141	142	3	470	454	580	2.76%								
142	142	1												3:1
144	146	2	476.5	475.54	64	1.50%	0.18	D	Roads (88% imp)	0.85	C=0.45 for landscape			
146	142	6	475.54	467.14	560	1.50%	1.31	D	Roads (88% imp)	0.85	C=0.45 for landscape			
142	142	1												3:2
135	137	2	483	481.5	75	2.00%	0.11	D	Dense Residential	0.75				
137	139	3	471.5	457	540	2.69%								
137	139	8					4.90	D	Dense Residential	0.75				
139	142	3	457	454	48	6.25%								
142	142	1												3:3
142	154	3	454	451.5	100	2.50%								
154	154													2:1
148	150	2	485	483.5	75	2.00%	0.18	D	Park	0.30				
150	152	3	481.5	463	740	2.50%								
150	152	8					6.58	D	Park	0.30				
152	154	3	463	451.5	200	5.75%								
154	154	1												2:2
154	154	11												1
154	154	12												1
154	158	3	451.5	395.4	840	6.68%								
158	158	1												2:1
154	156	2	465.8	463.8	72	2.78%	0.17	D	Road (88% imp) w/ Slope (43% of area)	0.75	C=0.45 for landscape, 0.60 for slope			
156	158	6	463.8	407.4	811	6.95%	4.16	D	Road (88% imp) w/ Slope (43% of area)	0.75	C=0.45 for landscape, 0.60 for slope			
158	158	1												2:2
158	160	3	395.4	394.2	100	1.20%								
160	160	1												3:1
161	162	2	470	468.5	75	2.00%	0.18	D	Dense Residential	0.75				
162	163	3	457.5	443	800	1.81%								
162	163	8					8.64	D	Dense Residential	0.75				
163	160	3	443	394.2	360	13.56%								
160	160	1												3:2
164	165	2	462	460.5	75	2.00%	0.25	D	Dense Residential	0.75				
165	166	3	449.5	432	800	2.19%								
165	166	8					8.77	D	Dense Residential	0.75				
166	160	3	432	394.2	700	5.40%								
160	160	1												3:3
160	172	3	394.2	365	700	4.17%								
172	172	1												2:1
168	170	2	413	411.8	65	1.85%	0.12	D	Roads (88% imp)	0.85	C=0.45 for landscape			
170	172	6	411.8	381.8	850	3.53%	1.50	D	Roads (88% imp)	0.85	C=0.45 for landscape			
172	172	1												2:2
172	172	10												1

200	202	2	506	504.5	75	2.00%	0.21	D	Dense Residential	0.75				
202	204	3	493.5	479	770	1.88%								
202	204	8					8.99	D	Dense Residential	0.75				
201	206	8					1.22	D	Slope	0.60				
204	206	3	479	470	530	1.70%								
206	206	1												3:1
208	210	2	503.5	502	75	2.00%	0.17	D	Dense Residential	0.75				
210	206	3	491	470	760	2.76%								
210	206	8					9.40	D	Dense Residential	0.75				
207	206	8					0.39	D	Slope	0.60				
206	206	1												3:2
212	214	2	493.4	492.5	60	1.50%	0.21	D	Roads (88% imp)	0.85	C=0.45 for landscape			
214	206	6	492.5	480.9	925	1.25%	1.95	D	Roads (88% imp)	0.85	C=0.45 for landscape			
206	206	1												3:3
206	213	3	470	430	900	4.44%								
213	213	1												2:1
211	212	2	481.9	479.4	78	3.21%	0.22	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
212	213	6	479.4	440.3	760	5.14%	2.34	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
213	213	1												2:2
213	215	3	430	429.3	65	1.08%								
215	215	1												3:1
216	218	2	486	484.5	75	2.00%	0.18	D	School	0.80				
218	220	3	473.5	457.5	810	1.98%								
218	220	8					9.84	D	School	0.80				
220	215	3	457.5	429.3	220	12.82%								
215	215	1												3:2
222	224	2	465.8	463.2	80	3.25%	0.26	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
224	215	6	463.2	440.9	1020	2.19%	2.78	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
215	215	1												3:3
215	226	3	429.3	420	774	1.20%								
226	226	1												2:1
228	230	2	451	449	75	2.67%	0.18	D	Dense Residential	0.75				
230	226	3	438	420	790	2.28%								
230	226	8					9.99	D	Dense Residential	0.75				
226	226	1												2:2
226	258	3	420	380	180	22.22%								
258	258	1												2:1
254	256	2	408.5	407.2	65	2.00%	0.18	D	Road (88% imp) w/ Slope (30% of area)	0.78	C=0.45 for landscape, 0.60 for slope			
256	258	6	407.2	388.3	1060	1.78%	4.88	D	Road (88% imp) w/ Slope (30% of area)	0.78	C=0.45 for landscape, 0.60 for slope			
259	258	8					3.22	D	Road (88% imp) w/ Slope (30% of area)	0.78	C=0.45 for landscape, 0.60 for slope			
258	258	1												2:2
258	172	3	380	365	1700	0.88%								
172	172	11												1
172	172	12												1
172	174	3	365	358	530	1.32%								
174	174	1												3:1
176	178	2	390	388.5	75	2.00%	0.16	D	Dense Residential	0.75				
178	180	3	377.5	369	750	1.13%								
178	180	8					15.87	D	Dense Residential	0.75				
180	174	3	369	358	760	1.45%								
180	174	8					16.23	D	Dense Residential	0.75				
174	174	1												3:2
182	184	2	405	387	100	18.00%	0.16	D	Dense Residential	0.75				
184	186	3	376	369	800	0.88%								
184	186	8					13.09	D	Dense Residential	0.75				
186	174	3	369	358	630	1.75%								
186	174	8					11.60	D	Dense Residential	0.75				
174	174	1												3:3
174	188	3	358	355	180	1.67%								
188	188	8					1.22	D	Park	0.30				
188	190	3	355	305	660	7.58%								
190	190	10												1

232	234	2	572.3	570.4	70	2.71%	0.14	D	Roads (88% imp)	0.85	C=0.45 for landscape			
234	236	6	570.4	502.9	980	6.89%	1.56	D	Roads (88% imp)	0.85	C=0.45 for landscape			
236	238	3	499	454	930	4.84%								
238	238	1												2:1
240	242	2	503.9	502.6	65	2.00%	0.24	D	Roads (88% imp)	0.85	C=0.45 for landscape			
242	238	6	502.6	467.2	1020	3.47%	2.05	D	Roads (88% imp)	0.85	C=0.45 for landscape			
238	238	1												2:2
238	240	3	464	392.5	990	7.22%								
240	240	1												2:1
242	244	2	476.5	474.1	75	3.20%	0.18	D	Road (88% imp) w/ Slope (18% of area) and additional lanscape (28% of area)	0.69	C=0.45 for landscape, 0.60 for slope			
244	240	6	474.1	406.5	1250	5.41%	5.02	D	Road (88% imp) w/ Slope (18% of area) and additional lanscape (28% of area)	0.69	C=0.45 for landscape, 0.60 for slope			
240	240	1												2:2
240	242	3	392.5	391.5	100	1.00%								
242	242	1												3:1
248	250	2	470	468.5	75	2.00%	0.18	D	Dense Residential	0.75				
250	252	3	457	442	740	2.03%								
250	252	8					8.11	D	Dense Residential	0.75				
252	242	3	442	391.5	260	19.42%								
242	242	1												3:2
244	246	2	413	412.1	60	1.50%	0.18	D	Road (88% imp) w/ Slope (25% of area)	0.79	C=0.45 for landscape, 0.60 for slope			
246	242	6	412.1	407	550	0.93%	4.77	D	Road (88% imp) w/ Slope (25% of area)	0.79	C=0.45 for landscape, 0.60 for slope			
242	242	1												3:3
242	190	3	391.5	305	1620	5.34%								
190	190	11												1
190	190	12												1
190	192	3	305	218	1200	7.25%								
192	192	1												2:1
194	196	2	338	336	80	2.50%	0.34	D	Park	0.30				
196	192	3	324	218	1415	7.49%								
196	192	8					25.38	D	Park	0.30				
193	192	8					1.36	D	Slopes & Access Road	0.60				
192	192	8					2.09	A	Basin	0.20				
192	192	1												2:2
192	198	3	215	205	248	4.03%								
198	198	8					1.08	D	Slopes	0.60				
198	198	1												2:1
512	514	2	370	320	100	50.00%	0.29	D	Slopes	0.60				
514	516	5	320	238	750	10.93%	26.24	D	Slopes-Rolling	0.50				
513	516	8					0.9		Normal Residential	0.65				
516	198	3	228	205	1000	2.30%								
198	198	1												2:2
							288.39							
300	302	2	559.6	557	80	3.25%	0.22	D	Roads (88% imp)	0.85	C=0.45 for landscape			
302	304	6	557	528	900	3.22%	3.73	D	Roads (88% imp)	0.85	C=0.45 for landscape			
304	305	3	519.36	512.54	113.26	6.02%								
306	305	8					3.84	D	Existing Road	0.75				
							7.79							
400	402	2	238	236	80	2.50%	0.17	D	Park	0.30				
402	404	3	224	205.2	940	2.00%								
402	404	8					13.56	D	Park	0.30				
404	404	8					0.15	A	Basin	0.20				
404	405	3	209	206	30	10.00%								
405	405	10												1
504	506	2	340	300	100	40.00%	0.29	D	Slopes-Rolling	0.50				
506	507	5	300	240	830	7.23%	13.13	D	Slopes-Rolling	0.50				
507	513	3	220	212	500	1.60%								
513	513	1												2:1
509	511	2	325	318	100	7.00%	0.3	D	Slopes-Rolling	0.50				
511	513	5	318	222	930	10.32%	13.77	D	Slopes-Rolling	0.50				
513	513	1												2:2
513	405	3	212	207	834	0.60%								
405	405	11												1
405	405	12												1
405	406	3	206	180	740	3.51%								
406	406	1												2:1
			EVENT	Q (CFS)	A (AC)	TC (MIN)	EVENT	Q (CFS)	A (AC)	TC (MIN)				
406	406	7	100-YR	347.24	181.2	21.39	50-YR	306.14	181.2	21.52				2:2
406	406	1												
408	406	8					1.38	D	Slopes	0.60				1
518	406	8					0.54	D	Slopes	0.60				
510	406	8					1.58	D	Slopes	0.60				
511	406	8					4.35	D	Slopes-Rolling	0.50				
							230.42	+181.2						
500	501	2	600	590	100	10.00%	0.36	D	Slopes	0.60				
501	502	5	590	375	3530	6.09%	12.33	D	Slopes-rolling	0.50				
502	503	3	375	335	874									
503	503	8					4.81	D	Slopes-rolling	0.50				
							17.5							
600	601	2	374	340	100	34.00%	0.18	D	Slopes	0.60				
601	602	5	340	305	600	5.83%	1.56	D	Slopes	0.60				
							1.74							
						Total Area	545.84							

Nodes with land use labeled as "Roads"are composed by road, median landscape, parkways, and lanscape buffers and have an assumed 88% imperviousnes. This number will be reconciled during final engineering. Nodes 242-244 have additional lanscape not accounted for by the street cross sections defined in the TM. This series has a lower runoff coefficient when compared to other similar series due to 1.45 acres of landscape that are not covered as "parkways, or landscape buffers" that drain into the streets.

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

            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 *************************
* Otay Ranch Village 8 East                                             *
* 100-Year Developed Condition                                          *
* DLN: 0920, W.O. 2395-0039                                             *
 ************************************************************************

  FILE NAME: R:\0920\HYD\TM\DR\CALCS\AES\100PR.DAT
  TIME/DATE OF STUDY: 08:49 09/15/2023
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.350
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  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   42.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   38.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   24.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   25.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   25.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   16.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  7   12.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  8   20.0     10.0    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 =  0.50 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.*

+----------------------------------------------------------------------------+
| AREA TRIBUTARY TO DETENTION BASIN                                          |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    574.80
```

```
  DOWNSTREAM ELEVATION(FEET) =    574.10
  ELEVATION DIFFERENCE(FEET) =      0.70
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.955
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   563.10  DOWNSTREAM(FEET) =   554.15
  FLOW LENGTH(FEET) =  1100.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.06
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.60
  PIPE TRAVEL TIME(MIN.) =   5.99    Tc(MIN.) =   10.95
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.735
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.66   SUBAREA RUNOFF(CFS) =   24.26
  TOTAL AREA(ACRES) =        8.8   TOTAL RUNOFF(CFS) =      24.62
  TC(MIN.) =   10.95

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 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) =   554.15  DOWNSTREAM(FEET) =   551.80
  FLOW LENGTH(FEET) =   470.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.62
  PIPE TRAVEL TIME(MIN.) =   1.24    Tc(MIN.) =   12.18
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.18
  RAINFALL INTENSITY(INCH/HR) =   3.49
  TOTAL STREAM AREA(ACRES) =     8.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.62

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =    572.30
  DOWNSTREAM ELEVATION(FEET) =    571.20
  ELEVATION DIFFERENCE(FEET) =      1.10
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.005
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.95
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.95

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  571.20  DOWNSTREAM ELEVATION(FEET) =  560.00
  STREET LENGTH(FEET) =   900.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 42.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       7.45
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   5.62   Tc(MIN.) =    8.63
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.355
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    3.42      SUBAREA RUNOFF(CFS) =   12.66
  TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      13.33

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  14.35
  FLOW VELOCITY(FEET/SEC.) =  3.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
  LONGEST FLOWPATH FROM NODE    104.00 TO NODE    106.00 =     964.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.63
  RAINFALL INTENSITY(INCH/HR) =   4.35
  TOTAL STREAM AREA(ACRES) =     3.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.33

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.62    12.18        3.486          8.79
      2       13.33     8.63        4.355          3.60

  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       30.77     8.63       4.355
      2       35.29    12.18       3.486

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.29   Tc(MIN.) =   12.18
  TOTAL AREA(ACRES) =       12.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   551.80  DOWNSTREAM(FEET) =   490.17
  FLOW LENGTH(FEET) =  1110.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  17.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.79
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.29
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =   13.28
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    110.00 =    2745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.28
  RAINFALL INTENSITY(INCH/HR) =   3.30
  TOTAL STREAM AREA(ACRES) =    12.39
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.29

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    559.60
  DOWNSTREAM ELEVATION(FEET) =    557.05
  ELEVATION DIFFERENCE(FEET) =      2.55
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.735
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.74

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  557.05  DOWNSTREAM ELEVATION(FEET) =  495.00
  STREET LENGTH(FEET) =   834.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       4.63
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.80
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.19
  STREET FLOW TRAVEL TIME(MIN.) =   2.90   Tc(MIN.) =    5.63
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.735
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.59      SUBAREA RUNOFF(CFS) =    7.75
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       8.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.10
  FLOW VELOCITY(FEET/SEC.) =  5.44   DEPTH*VELOCITY(FT*FT/SEC.) =   1.57
  LONGEST FLOWPATH FROM NODE    107.00 TO NODE    110.00 =     914.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 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.) =    5.63
  RAINFALL INTENSITY(INCH/HR) =   5.73
  TOTAL STREAM AREA(ACRES) =     1.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.43

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       35.29    13.28        3.297         12.39
      2        8.43     5.63        5.735          1.73

  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       28.72     5.63       5.735
      2       40.14    13.28       3.297

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      40.14   Tc(MIN.) =   13.28
  TOTAL AREA(ACRES) =       14.1
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    110.00 =    2745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 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) =   487.00  DOWNSTREAM(FEET) =   480.80
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.67
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      40.14
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =   13.45
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    124.00 =    2897.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  10
```

```
------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
========================================================================

************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    518.00
  DOWNSTREAM ELEVATION(FEET) =    516.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.93
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.93

************************************************************************
  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) =   505.00  DOWNSTREAM(FEET) =   489.00
  FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.78
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.93
  PIPE TRAVEL TIME(MIN.) =   2.79    Tc(MIN.) =    7.12
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    116.00 =     875.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.928
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    9.39   SUBAREA RUNOFF(CFS) =   34.71
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =      35.45
  TC(MIN.) =    7.12

************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    116.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.928
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7311
  SUBAREA AREA(ACRES) =    1.38   SUBAREA RUNOFF(CFS) =    4.08
  TOTAL AREA(ACRES) =       11.0   TOTAL RUNOFF(CFS) =      39.53
  TC(MIN.) =    7.12

************************************************************************
  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) =   489.00  DOWNSTREAM(FEET) =   482.00
  FLOW LENGTH(FEET) =   560.00   MANNING'S N =  0.013
```

```
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.04
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      39.53
 PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    8.05
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    122.00 =    1435.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.05
 RAINFALL INTENSITY(INCH/HR) =   4.55
 TOTAL STREAM AREA(ACRES) =    10.97
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     39.53

****************************************************************************
 FLOW PROCESS FROM NODE    118.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .8500
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
 UPSTREAM ELEVATION(FEET) =    503.90
 DOWNSTREAM ELEVATION(FEET) =    503.10
 ELEVATION DIFFERENCE(FEET) =      0.80
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.167
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      1.26
 TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      1.26

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  5 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.10  DOWNSTREAM ELEVATION(FEET) =  493.00
 STREET LENGTH(FEET) =   750.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  18.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 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) =       5.23
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.32
   HALFSTREET FLOOD WIDTH(FEET) =    9.57
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.53
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.80
 STREET FLOW TRAVEL TIME(MIN.) =   4.94   Tc(MIN.) =    8.11
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.534
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .8500
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 SUBAREA AREA(ACRES) =    2.01      SUBAREA RUNOFF(CFS) =    7.75
 TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =       8.67

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.82
```

```
 FLOW VELOCITY(FEET/SEC.) =  2.86   DEPTH*VELOCITY(FT*FT/SEC.) =   1.04
 LONGEST FLOWPATH FROM NODE    118.00 TO NODE    122.00 =     810.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.11
 RAINFALL INTENSITY(INCH/HR) =   4.53
 TOTAL STREAM AREA(ACRES) =     2.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.67

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    126.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    516.00
 DOWNSTREAM ELEVATION(FEET) =    514.50
 ELEVATION DIFFERENCE(FEET) =      1.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.79
 TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.79

****************************************************************************
 FLOW PROCESS FROM NODE    126.00 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) =   503.00  DOWNSTREAM(FEET) =   482.00
 FLOW LENGTH(FEET) =   890.00   MANNING'S N =  0.012
 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.) =   4.81
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.79
 PIPE TRAVEL TIME(MIN.) =   3.08    Tc(MIN.) =    7.41
 LONGEST FLOWPATH FROM NODE    123.00 TO NODE    122.00 =     965.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    126.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.803
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    9.63   SUBAREA RUNOFF(CFS) =   34.69
 TOTAL AREA(ACRES) =        9.8   TOTAL RUNOFF(CFS) =      35.30
 TC(MIN.) =    7.41

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.803
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7326
 SUBAREA AREA(ACRES) =    1.29   SUBAREA RUNOFF(CFS) =    3.72
```

```
 TOTAL AREA(ACRES) =       11.1   TOTAL RUNOFF(CFS) =      39.02
 TC(MIN.) =    7.41

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.41
 RAINFALL INTENSITY(INCH/HR) =   4.80
 TOTAL STREAM AREA(ACRES) =    11.09
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     39.02

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       39.53     8.05        4.553         10.97
     2        8.67     8.11        4.534          2.25
     3       39.02     7.41        4.803         11.09

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       83.34     7.41       4.803
     2       85.13     8.05       4.553
     3       84.86     8.11       4.534

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      85.13   Tc(MIN.) =    8.05
 TOTAL AREA(ACRES) =       24.3
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    122.00 =    1435.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 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) =   482.00  DOWNSTREAM(FEET) =   480.80
 FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.21
 ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      85.13
 PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    8.23
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    124.00 =    1555.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 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       85.13     8.23       4.489       24.31
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    124.00 =    1555.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       40.14    13.45       3.271       14.12
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    124.00 =    2897.00 FEET.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     109.70       8.23        4.489
      2     102.17      13.45        3.271

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     109.70   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =       38.4

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   480.80  DOWNSTREAM(FEET) =   468.00
  FLOW LENGTH(FEET) =   344.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  26.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.54
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     109.70
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    8.52
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    127.00 =    3241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 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.) =    8.52
  RAINFALL INTENSITY(INCH/HR) =   4.39
  TOTAL STREAM AREA(ACRES) =    38.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    109.70

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    501.00
  DOWNSTREAM ELEVATION(FEET) =    490.50
  ELEVATION DIFFERENCE(FEET) =     10.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.924
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.02
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      1.02

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   468.00
  FLOW LENGTH(FEET) =  1068.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.7 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.94
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.02
  PIPE TRAVEL TIME(MIN.) =   4.51    Tc(MIN.) =    7.44
  LONGEST FLOWPATH FROM NODE    128.00 TO NODE    127.00 =    1168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.792
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   10.06   SUBAREA RUNOFF(CFS) =   36.16
  TOTAL AREA(ACRES) =       10.3   TOTAL RUNOFF(CFS) =      36.95
  TC(MIN.) =    7.44

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 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.) =    7.44
  RAINFALL INTENSITY(INCH/HR) =   4.79
  TOTAL STREAM AREA(ACRES) =    10.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     36.95

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      109.70     8.52        4.389         38.43
      2       36.95     7.44        4.792         10.28

  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      132.68     7.44       4.792
      2      143.54     8.52       4.389

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     143.54   Tc(MIN.) =    8.52
  TOTAL AREA(ACRES) =       48.7
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    127.00 =    3241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 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) =   468.00  DOWNSTREAM(FEET) =   456.00
  FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.35
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     143.54
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    8.87
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    132.00 =    3641.00 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.) =    8.87
  RAINFALL INTENSITY(INCH/HR) =   4.28
  TOTAL STREAM AREA(ACRES) =    48.71
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    143.54

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    84.00
  UPSTREAM ELEVATION(FEET) =    493.40
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      3.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.588
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.95
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.95

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    132.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  490.00  DOWNSTREAM ELEVATION(FEET) =  468.00
  STREET LENGTH(FEET) =   700.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       4.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.65
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.49
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.98
  STREET FLOW TRAVEL TIME(MIN.) =   3.34   Tc(MIN.) =    5.93
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.548
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.67      SUBAREA RUNOFF(CFS) =    7.88
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       8.72

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.90
  FLOW VELOCITY(FEET/SEC.) =  3.97   DEPTH*VELOCITY(FT*FT/SEC.) =   1.29
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    132.00 =     784.00 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.) =    5.93
  RAINFALL INTENSITY(INCH/HR) =   5.55
  TOTAL STREAM AREA(ACRES) =     1.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.72

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      143.54     8.87        4.278         48.71
      2        8.72     5.93        5.548          1.85

  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      119.41     5.93       5.548
      2      150.27     8.87       4.278

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     150.27   Tc(MIN.) =    8.87
  TOTAL AREA(ACRES) =       50.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    132.00 =    3641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    154.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   456.00  DOWNSTREAM(FEET) =   453.80
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  32.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.39
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     150.27
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    8.96
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    154.00 =    3741.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    485.00
  DOWNSTREAM ELEVATION(FEET) =    483.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.79
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.79

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.50  DOWNSTREAM(FEET) =   454.00
  FLOW LENGTH(FEET) =  1100.00   MANNING'S N =  0.012
```

```
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.96
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.79
 PIPE TRAVEL TIME(MIN.) =   3.69    Tc(MIN.) =    8.02
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    141.00 =    1175.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.563
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    5.56   SUBAREA RUNOFF(CFS) =   19.03
 TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =      19.61
 TC(MIN.) =    8.02

****************************************************************************
 FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   470.00  DOWNSTREAM(FEET) =   454.00
 FLOW LENGTH(FEET) =   580.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.49
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      19.61
 PIPE TRAVEL TIME(MIN.) =   0.84    Tc(MIN.) =    8.87
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    142.00 =    1755.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.87
 RAINFALL INTENSITY(INCH/HR) =   4.28
 TOTAL STREAM AREA(ACRES) =     5.73
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.61

****************************************************************************
 FLOW PROCESS FROM NODE    144.00 TO NODE    146.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .8500
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
 UPSTREAM ELEVATION(FEET) =    476.50
 DOWNSTREAM ELEVATION(FEET) =    475.38
 ELEVATION DIFFERENCE(FEET) =      1.12
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.987
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.95
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.95

****************************************************************************
 FLOW PROCESS FROM NODE    146.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
```

```
 UPSTREAM ELEVATION(FEET) =  475.38  DOWNSTREAM ELEVATION(FEET) =  466.98
 STREET LENGTH(FEET) =   560.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 24.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 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) =       3.82
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.29
   HALFSTREET FLOOD WIDTH(FEET) =    8.10
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.47
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.71
 STREET FLOW TRAVEL TIME(MIN.) =   3.78   Tc(MIN.) =    6.77
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.091
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .8500
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 SUBAREA AREA(ACRES) =    1.31      SUBAREA RUNOFF(CFS) =    5.67
 TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       6.45

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.24
 FLOW VELOCITY(FEET/SEC.) =  2.77   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
 LONGEST FLOWPATH FROM NODE    144.00 TO NODE    142.00 =     624.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.77
 RAINFALL INTENSITY(INCH/HR) =   5.09
 TOTAL STREAM AREA(ACRES) =     1.49
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.45

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    137.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    483.00
 DOWNSTREAM ELEVATION(FEET) =    481.50
 ELEVATION DIFFERENCE(FEET) =      1.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.51
 TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
 FLOW PROCESS FROM NODE    137.00 TO NODE    139.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   471.50  DOWNSTREAM(FEET) =   457.00
 FLOW LENGTH(FEET) =   540.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.2 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.18
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.51
  PIPE TRAVEL TIME(MIN.) =   2.15    Tc(MIN.) =    6.49
  LONGEST FLOWPATH FROM NODE    135.00 TO NODE    139.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    139.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.235
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    4.90   SUBAREA RUNOFF(CFS) =   19.24
  TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      19.67
  TC(MIN.) =    6.49

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   457.00  DOWNSTREAM(FEET) =   454.00
  FLOW LENGTH(FEET) =    48.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.62
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.67
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    6.54
  LONGEST FLOWPATH FROM NODE    135.00 TO NODE    142.00 =     663.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.54
  RAINFALL INTENSITY(INCH/HR) =   5.21
  TOTAL STREAM AREA(ACRES) =     5.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.67

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       19.61     8.87        4.279          5.73
      2        6.45     6.77        5.091          1.49
      3       19.67     6.54        5.209          5.01

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       40.35     6.54       5.209
      2       40.66     6.77       5.091
      3       41.19     8.87       4.279

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      41.19   Tc(MIN.) =    8.87
  TOTAL AREA(ACRES) =       12.2
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    142.00 =    1755.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    154.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   454.00  DOWNSTREAM(FEET) =   451.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.20
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      41.19
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.99
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1855.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 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.) =    8.99
  RAINFALL INTENSITY(INCH/HR) =   4.24
  TOTAL STREAM AREA(ACRES) =    12.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     41.19

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    150.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    485.00
  DOWNSTREAM ELEVATION(FEET) =    483.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.898
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.986
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    152.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.50  DOWNSTREAM(FEET) =   463.00
  FLOW LENGTH(FEET) =   740.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.37
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.22
  PIPE TRAVEL TIME(MIN.) =   3.66    Tc(MIN.) =   13.55
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    152.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.254
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =    6.58   SUBAREA RUNOFF(CFS) =    6.42
  TOTAL AREA(ACRES) =        6.8   TOTAL RUNOFF(CFS) =       6.60
  TC(MIN.) =   13.55

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

```
 FLOW PROCESS FROM NODE    152.00 TO NODE    154.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   463.00  DOWNSTREAM(FEET) =   451.50
 FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.56
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.60
 PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   13.84
 LONGEST FLOWPATH FROM NODE    148.00 TO NODE    154.00 =    1015.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.84
 RAINFALL INTENSITY(INCH/HR) =   3.21
 TOTAL STREAM AREA(ACRES) =     6.76
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.60

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       41.19     8.99        4.240         12.23
     2        6.60    13.84        3.210          6.76

 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       45.48     8.99       4.240
     2       37.79    13.84       3.210

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      45.48   Tc(MIN.) =    8.99
 TOTAL AREA(ACRES) =       19.0
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1855.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    154.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   454.00  DOWNSTREAM(FEET) =   451.50
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.32
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      45.48
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    9.12
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1955.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 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       45.48     9.12       4.203       18.99
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1955.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      150.27     8.96       4.249       50.56
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    154.00 =    3741.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     194.98       8.96        4.249
      2     194.12       9.12        4.203

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     194.98   Tc(MIN.) =    8.96
  TOTAL AREA(ACRES) =       69.5

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    158.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   451.50  DOWNSTREAM(FEET) =   395.40
  FLOW LENGTH(FEET) =   840.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  30.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.79
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     194.98
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    9.47
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    158.00 =    4581.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    158.00 TO NODE    158.00 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.) =    9.47
  RAINFALL INTENSITY(INCH/HR) =   4.10
  TOTAL STREAM AREA(ACRES) =    69.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    194.98

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    156.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =    465.80
  DOWNSTREAM ELEVATION(FEET) =    463.80
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.803
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.79
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.79

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

```
 FLOW PROCESS FROM NODE    156.00 TO NODE    158.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  463.80  DOWNSTREAM ELEVATION(FEET) =  407.40
 STREET LENGTH(FEET) =   811.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 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) =       9.19
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.30
   HALFSTREET FLOOD WIDTH(FEET) =    8.55
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.41
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.61
 STREET FLOW TRAVEL TIME(MIN.) =   2.50   Tc(MIN.) =    6.30
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.333
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .7500
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
 SUBAREA AREA(ACRES) =    4.16      SUBAREA RUNOFF(CFS) =   16.64
 TOTAL AREA(ACRES) =        4.3        PEAK FLOW RATE(CFS) =      17.32

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.25
 FLOW VELOCITY(FEET/SEC.) =  6.26   DEPTH*VELOCITY(FT*FT/SEC.) =   2.20
 LONGEST FLOWPATH FROM NODE    154.00 TO NODE    158.00 =     883.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    158.00 TO NODE    158.00 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.) =    6.30
 RAINFALL INTENSITY(INCH/HR) =   5.33
 TOTAL STREAM AREA(ACRES) =     4.33
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.32

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1      194.98     9.47        4.102         69.55
     2       17.32     6.30        5.333          4.33

 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      147.09     6.30       5.333
     2      208.30     9.47       4.102

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     208.30   Tc(MIN.) =    9.47
 TOTAL AREA(ACRES) =       73.9
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    158.00 =    4581.00 FEET.

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

```
 FLOW PROCESS FROM NODE    158.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.40  DOWNSTREAM(FEET) =   394.20
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  57.0 INCH PIPE IS  41.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.04
 ESTIMATED PIPE DIAMETER(INCH) =  57.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     208.30
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.58
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =    4681.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.58
 RAINFALL INTENSITY(INCH/HR) =   4.07
 TOTAL STREAM AREA(ACRES) =    73.88
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    208.30

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    470.00
 DOWNSTREAM ELEVATION(FEET) =    468.50
 ELEVATION DIFFERENCE(FEET) =      1.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.84
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.84

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   457.50  DOWNSTREAM(FEET) =   443.00
 FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
 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.) =   4.45
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.84
 PIPE TRAVEL TIME(MIN.) =   2.99    Tc(MIN.) =    7.32
 LONGEST FLOWPATH FROM NODE    161.00 TO NODE    163.00 =     875.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.841
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    8.64   SUBAREA RUNOFF(CFS) =   31.37
 TOTAL AREA(ACRES) =        8.8   TOTAL RUNOFF(CFS) =      32.02
 TC(MIN.) =    7.32
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    163.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   443.00  DOWNSTREAM(FEET) =   394.20
  FLOW LENGTH(FEET) =   360.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.02
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    7.56
  LONGEST FLOWPATH FROM NODE    161.00 TO NODE    160.00 =    1235.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.56
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     8.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     32.02

****************************************************************************
  FLOW PROCESS FROM NODE    164.00 TO NODE    165.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    462.00
  DOWNSTREAM ELEVATION(FEET) =    460.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.16
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.16

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    166.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   449.50  DOWNSTREAM(FEET) =   432.00
  FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
  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.) =   5.27
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.16
  PIPE TRAVEL TIME(MIN.) =   2.53    Tc(MIN.) =    6.86
  LONGEST FLOWPATH FROM NODE    164.00 TO NODE    166.00 =     875.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    166.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.049
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.77   SUBAREA RUNOFF(CFS) =   33.21
```

```
  TOTAL AREA(ACRES) =        9.0   TOTAL RUNOFF(CFS) =      34.15
  TC(MIN.) =    6.86

****************************************************************************
  FLOW PROCESS FROM NODE    166.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   432.00  DOWNSTREAM(FEET) =   394.20
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.55
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      34.15
  PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    164.00 TO NODE    160.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.57
  RAINFALL INTENSITY(INCH/HR) =   4.74
  TOTAL STREAM AREA(ACRES) =     9.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     34.15

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      208.30     9.58        4.071         73.88
      2       32.02     7.56        4.741          8.82
      3       34.15     7.57        4.740          9.02

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      245.03     7.56       4.741
      2      245.07     7.57       4.740
      3      265.13     9.58       4.071

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     265.13   Tc(MIN.) =    9.58
  TOTAL AREA(ACRES) =       91.7
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =    4681.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    172.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   394.20  DOWNSTREAM(FEET) =   365.00
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  37.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.21
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     265.13
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =   10.04
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    172.00 =    5381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.04
  RAINFALL INTENSITY(INCH/HR) =   3.95
  TOTAL STREAM AREA(ACRES) =    91.72
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    265.13

****************************************************************************
  FLOW PROCESS FROM NODE    168.00 TO NODE    170.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    413.00
  DOWNSTREAM ELEVATION(FEET) =    411.80
  ELEVATION DIFFERENCE(FEET) =      1.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.957
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    172.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  411.80  DOWNSTREAM ELEVATION(FEET) =  381.80
  STREET LENGTH(FEET) =   850.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       3.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.58
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.49
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
  STREET FLOW TRAVEL TIME(MIN.) =   4.06   Tc(MIN.) =    7.02
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.974
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    6.34
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       6.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   8.73
  FLOW VELOCITY(FEET/SEC.) =  3.89   DEPTH*VELOCITY(FT*FT/SEC.) =   1.17
  LONGEST FLOWPATH FROM NODE    168.00 TO NODE    172.00 =     915.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 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.) =    7.02
  RAINFALL INTENSITY(INCH/HR) =   4.97
  TOTAL STREAM AREA(ACRES) =     1.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      265.13    10.04        3.949         91.72
      2        6.85     7.02        4.974          1.62

  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      217.36     7.02       4.974
      2      270.57    10.04       3.949

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     270.57   Tc(MIN.) =   10.04
  TOTAL AREA(ACRES) =       93.3
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    172.00 =    5381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    506.00
  DOWNSTREAM ELEVATION(FEET) =    504.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.98
  TOTAL AREA(ACRES) =      0.21   TOTAL RUNOFF(CFS) =      0.98

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   493.50  DOWNSTREAM(FEET) =   479.00
  FLOW LENGTH(FEET) =   770.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.74
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.98
  PIPE TRAVEL TIME(MIN.) =   2.71    Tc(MIN.) =    7.04
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     845.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.966
```

```
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.99   SUBAREA RUNOFF(CFS) =   33.48
  TOTAL AREA(ACRES) =        9.2   TOTAL RUNOFF(CFS) =      34.27
  TC(MIN.) =    7.04

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.966
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7324
  SUBAREA AREA(ACRES) =    1.22   SUBAREA RUNOFF(CFS) =    3.64
  TOTAL AREA(ACRES) =       10.4   TOTAL RUNOFF(CFS) =      37.90
  TC(MIN.) =    7.04

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   501.40  DOWNSTREAM(FEET) =   470.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.13
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      37.90
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    7.53
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1375.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.53
  RAINFALL INTENSITY(INCH/HR) =   4.76
  TOTAL STREAM AREA(ACRES) =    10.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     37.90

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    503.50
  DOWNSTREAM ELEVATION(FEET) =    502.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.79
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.79

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.00  DOWNSTREAM(FEET) =   470.00
```

```
  FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.08
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.79
  PIPE TRAVEL TIME(MIN.) =   2.49    Tc(MIN.) =    6.82
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    206.00 =     835.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.066
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    9.40   SUBAREA RUNOFF(CFS) =   35.72
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =      36.36
  TC(MIN.) =    6.82

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.066
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7441
  SUBAREA AREA(ACRES) =    0.39   SUBAREA RUNOFF(CFS) =    1.19
  TOTAL AREA(ACRES) =       10.0   TOTAL RUNOFF(CFS) =      37.55
  TC(MIN.) =    6.82

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.82
  RAINFALL INTENSITY(INCH/HR) =   5.07
  TOTAL STREAM AREA(ACRES) =     9.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     37.55

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    493.40
  DOWNSTREAM ELEVATION(FEET) =    492.50
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.045
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.11
  TOTAL AREA(ACRES) =      0.21   TOTAL RUNOFF(CFS) =      1.11

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    206.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  5 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  492.50  DOWNSTREAM ELEVATION(FEET) =  480.90
```

```
  STREET LENGTH(FEET) =   925.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  18.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       4.60
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.14
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.41
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
  STREET FLOW TRAVEL TIME(MIN.) =   6.39   Tc(MIN.) =    9.44
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.110
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.95      SUBAREA RUNOFF(CFS) =    6.81
  TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =       7.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.32
  FLOW VELOCITY(FEET/SEC.) =  2.69   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE    212.00 TO NODE    206.00 =     985.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.44
  RAINFALL INTENSITY(INCH/HR) =   4.11
  TOTAL STREAM AREA(ACRES) =     2.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.55

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       37.90     7.53        4.756         10.42
      2       37.55     6.82        5.066          9.96
      3        7.55     9.44        4.110          2.16

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       77.37     6.82       5.066
      2       79.17     7.53       4.756
      3       70.76     9.44       4.110

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      79.17   Tc(MIN.) =    7.53
  TOTAL AREA(ACRES) =       22.5
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1375.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    213.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   470.00  DOWNSTREAM(FEET) =   430.00
  FLOW LENGTH(FEET) =   900.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.04
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      79.17
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =    8.31
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =    2275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    213.00 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.) =    8.31
  RAINFALL INTENSITY(INCH/HR) =   4.46
  TOTAL STREAM AREA(ACRES) =    22.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     79.17

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    78.00
  UPSTREAM ELEVATION(FEET) =    481.90
  DOWNSTREAM ELEVATION(FEET) =    479.40
  ELEVATION DIFFERENCE(FEET) =      2.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.235
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.09
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      1.09

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  5 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  479.40  DOWNSTREAM ELEVATION(FEET) =  440.30
  STREET LENGTH(FEET) =   760.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  18.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       6.22
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.60
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.24
  STREET FLOW TRAVEL TIME(MIN.) =   2.83   Tc(MIN.) =    6.07
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.466
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  SUBAREA AREA(ACRES) =    2.34      SUBAREA RUNOFF(CFS) =   10.23
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =      11.19
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.92
  FLOW VELOCITY(FEET/SEC.) =  5.08   DEPTH*VELOCITY(FT*FT/SEC.) =   1.65
  LONGEST FLOWPATH FROM NODE    211.00 TO NODE    213.00 =     838.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    213.00 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.) =    6.07
  RAINFALL INTENSITY(INCH/HR) =   5.47
  TOTAL STREAM AREA(ACRES) =     2.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.19

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       79.17     8.31        4.460         22.54
      2       11.19     6.07        5.466          2.56

  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       75.80     6.07       5.466
      2       88.31     8.31       4.460

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      88.31   Tc(MIN.) =    8.31
  TOTAL AREA(ACRES) =       25.1
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =    2275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    215.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   430.00  DOWNSTREAM(FEET) =   429.30
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.64
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      88.31
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.41
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    215.00 =    2340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.41
  RAINFALL INTENSITY(INCH/HR) =   4.43
  TOTAL STREAM AREA(ACRES) =    25.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     88.31

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    218.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .8000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    486.00
  DOWNSTREAM ELEVATION(FEET) =    484.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.712
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.89
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.89

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   473.50  DOWNSTREAM(FEET) =   457.50
  FLOW LENGTH(FEET) =   810.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.68
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.89
  PIPE TRAVEL TIME(MIN.) =   2.88    Tc(MIN.) =    6.59
  LONGEST FLOWPATH FROM NODE    216.00 TO NODE    220.00 =     885.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.179
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .8000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8000
  SUBAREA AREA(ACRES) =    9.84   SUBAREA RUNOFF(CFS) =   40.77
  TOTAL AREA(ACRES) =       10.0   TOTAL RUNOFF(CFS) =      41.52
  TC(MIN.) =    6.59

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    215.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   457.50  DOWNSTREAM(FEET) =   429.30
  FLOW LENGTH(FEET) =   220.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.69
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      41.52
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    6.74
  LONGEST FLOWPATH FROM NODE    216.00 TO NODE    215.00 =    1105.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.74
  RAINFALL INTENSITY(INCH/HR) =   5.11
  TOTAL STREAM AREA(ACRES) =    10.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     41.52

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    224.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    465.80
  DOWNSTREAM ELEVATION(FEET) =    463.20
  ELEVATION DIFFERENCE(FEET) =      2.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.261
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.29
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      1.29

******************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    214.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  463.20  DOWNSTREAM ELEVATION(FEET) =  440.90
  STREET LENGTH(FEET) =  1020.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       6.27
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.33
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.99
  STREET FLOW TRAVEL TIME(MIN.) =   5.36   Tc(MIN.) =    8.62
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.356
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  SUBAREA AREA(ACRES) =    2.78      SUBAREA RUNOFF(CFS) =    9.69
  TOTAL AREA(ACRES) =        3.0        PEAK FLOW RATE(CFS) =      10.59

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.63
  FLOW VELOCITY(FEET/SEC.) =  3.60   DEPTH*VELOCITY(FT*FT/SEC.) =   1.29
  LONGEST FLOWPATH FROM NODE    222.00 TO NODE    214.00 =    1100.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.62
  RAINFALL INTENSITY(INCH/HR) =   4.36
  TOTAL STREAM AREA(ACRES) =     3.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.59

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       88.31     8.41        4.429         25.10
      2       41.52     6.74        5.106         10.02
      3       10.59     8.62        4.356          3.04
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      126.40     6.74       5.106
      2      134.64     8.41       4.429
      3      132.88     8.62       4.356

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     134.64   Tc(MIN.) =    8.41
  TOTAL AREA(ACRES) =       38.2
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    215.00 =    2340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.30  DOWNSTREAM(FEET) =   420.00
  FLOW LENGTH(FEET) =   774.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  35.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.45
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     134.64
  PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =    9.37
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    226.00 =    3114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 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.) =    9.37
  RAINFALL INTENSITY(INCH/HR) =   4.13
  TOTAL STREAM AREA(ACRES) =    38.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    134.64

****************************************************************************
  FLOW PROCESS FROM NODE    228.00 TO NODE    230.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    451.00
  DOWNSTREAM ELEVATION(FEET) =    449.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.935
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.84
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.84

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.00  DOWNSTREAM(FEET) =   420.00
  FLOW LENGTH(FEET) =   790.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.83
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.84
  PIPE TRAVEL TIME(MIN.) =   2.73    Tc(MIN.) =    6.66
  LONGEST FLOWPATH FROM NODE    228.00 TO NODE    226.00 =     865.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    226.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.146
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    9.99   SUBAREA RUNOFF(CFS) =   38.56
  TOTAL AREA(ACRES) =       10.2   TOTAL RUNOFF(CFS) =      39.25
  TC(MIN.) =    6.66

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 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.) =    6.66
  RAINFALL INTENSITY(INCH/HR) =   5.15
  TOTAL STREAM AREA(ACRES) =    10.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     39.25

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      134.64     9.37        4.131         38.16
      2       39.25     6.66        5.146         10.17

  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      147.32     6.66       5.146
      2      166.15     9.37       4.131

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     166.15   Tc(MIN.) =    9.37
  TOTAL AREA(ACRES) =       48.3
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    226.00 =    3114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    258.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   420.00  DOWNSTREAM(FEET) =   380.00
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  42.32
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     166.15
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.44
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    258.00 =    3294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    258.00 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.) =    9.44
  RAINFALL INTENSITY(INCH/HR) =   4.11
  TOTAL STREAM AREA(ACRES) =    48.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    166.15

****************************************************************************
  FLOW PROCESS FROM NODE    254.00 TO NODE    256.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7800
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    408.50
  DOWNSTREAM ELEVATION(FEET) =    407.20
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.686
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    256.00 TO NODE    258.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  407.20  DOWNSTREAM ELEVATION(FEET) =  392.50
  STREET LENGTH(FEET) =  1060.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 38.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       8.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   11.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.05
  STREET FLOW TRAVEL TIME(MIN.) =   6.12   Tc(MIN.) =    9.80
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.010
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7800
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.780
  SUBAREA AREA(ACRES) =    4.88      SUBAREA RUNOFF(CFS) =   15.26
  TOTAL AREA(ACRES) =        5.1        PEAK FLOW RATE(CFS) =      15.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.00
  FLOW VELOCITY(FEET/SEC.) =  3.34   DEPTH*VELOCITY(FT*FT/SEC.) =   1.42
  LONGEST FLOWPATH FROM NODE    254.00 TO NODE    258.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    259.00 TO NODE    258.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.010
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7800
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7800
```

```
  SUBAREA AREA(ACRES) =    3.22   SUBAREA RUNOFF(CFS) =   10.07
  TOTAL AREA(ACRES) =        8.3   TOTAL RUNOFF(CFS) =      25.90
  TC(MIN.) =    9.80

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    258.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.80
  RAINFALL INTENSITY(INCH/HR) =   4.01
  TOTAL STREAM AREA(ACRES) =     8.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.90

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      166.15     9.44        4.111         48.33
      2       25.90     9.80        4.010          8.28

  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      191.08     9.44       4.111
      2      188.00     9.80       4.010

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     191.08   Tc(MIN.) =    9.44
  TOTAL AREA(ACRES) =       56.6
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    258.00 =    3294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    172.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   380.00  DOWNSTREAM(FEET) =   365.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  36.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.92
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     191.08
  PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    9.88
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    172.00 =    3824.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 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      191.08     9.88       3.991       56.61
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    172.00 =    3824.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      270.57    10.04       3.949       93.34
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    172.00 =    5381.00 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     457.28       9.88        3.991
      2     459.65      10.04        3.949

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     459.65   Tc(MIN.) =   10.04
  TOTAL AREA(ACRES) =      150.0

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   365.00  DOWNSTREAM(FEET) =   358.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  72.0 INCH PIPE IS  58.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.62
  ESTIMATED PIPE DIAMETER(INCH) =  72.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     459.65
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   10.52
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    174.00 =    5911.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.52
  RAINFALL INTENSITY(INCH/HR) =   3.83
  TOTAL STREAM AREA(ACRES) =   149.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    459.65

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    178.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    390.00
  DOWNSTREAM ELEVATION(FEET) =    388.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.74

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   377.50  DOWNSTREAM(FEET) =   369.00
  FLOW LENGTH(FEET) =   750.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.66
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       0.74
  PIPE TRAVEL TIME(MIN.) =   3.41    Tc(MIN.) =    7.74
  LONGEST FLOWPATH FROM NODE    176.00 TO NODE    180.00 =     825.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.669
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   15.87   SUBAREA RUNOFF(CFS) =   55.58
  TOTAL AREA(ACRES) =       16.0   TOTAL RUNOFF(CFS) =      56.14
  TC(MIN.) =    7.74

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   369.00  DOWNSTREAM(FEET) =   358.00
  FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.38
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      56.14
  PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =    8.77
  LONGEST FLOWPATH FROM NODE    176.00 TO NODE    174.00 =    1585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    174.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.310
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   16.23   SUBAREA RUNOFF(CFS) =   52.46
  TOTAL AREA(ACRES) =       32.3   TOTAL RUNOFF(CFS) =     104.28
  TC(MIN.) =    8.77

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.77
  RAINFALL INTENSITY(INCH/HR) =   4.31
  TOTAL STREAM AREA(ACRES) =    32.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    104.28

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    184.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    405.00
  DOWNSTREAM ELEVATION(FEET) =    387.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.924
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.74

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    186.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   376.00  DOWNSTREAM(FEET) =   369.00
  FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
  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.) =   3.35
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.74
  PIPE TRAVEL TIME(MIN.) =   3.98    Tc(MIN.) =    6.90
  LONGEST FLOWPATH FROM NODE    182.00 TO NODE    186.00 =     900.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    186.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.028
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   13.09   SUBAREA RUNOFF(CFS) =   49.36
  TOTAL AREA(ACRES) =       13.2   TOTAL RUNOFF(CFS) =      49.97
  TC(MIN.) =    6.90

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   369.00  DOWNSTREAM(FEET) =   358.00
  FLOW LENGTH(FEET) =   630.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.84
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      49.97
  PIPE TRAVEL TIME(MIN.) =   0.82    Tc(MIN.) =    7.72
  LONGEST FLOWPATH FROM NODE    182.00 TO NODE    174.00 =    1530.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    174.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.678
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   11.60   SUBAREA RUNOFF(CFS) =   40.70
  TOTAL AREA(ACRES) =       24.9   TOTAL RUNOFF(CFS) =      87.18
  TC(MIN.) =    7.72

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.72
  RAINFALL INTENSITY(INCH/HR) =   4.68
```

```
  TOTAL STREAM AREA(ACRES) =    24.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     87.18

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      459.65    10.52        3.833        149.95
      2      104.28     8.77        4.310         32.26
      3       87.18     7.72        4.678         24.85

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      516.58     7.72       4.678
      2      567.83     8.77       4.310
      3      623.83    10.52       3.833

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     623.83   Tc(MIN.) =   10.52
  TOTAL AREA(ACRES) =      207.1
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    174.00 =    5911.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    188.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   358.00  DOWNSTREAM(FEET) =   355.00
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  78.0 INCH PIPE IS  62.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  22.05
  ESTIMATED PIPE DIAMETER(INCH) =  78.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     623.83
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =   10.65
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    188.00 =    6091.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    188.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.801
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7417
  SUBAREA AREA(ACRES) =    1.22   SUBAREA RUNOFF(CFS) =    1.39
  TOTAL AREA(ACRES) =      208.3   TOTAL RUNOFF(CFS) =     623.83
  TC(MIN.) =   10.65
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   355.00  DOWNSTREAM(FEET) =   305.00
  FLOW LENGTH(FEET) =   660.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  60.0 INCH PIPE IS  45.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  39.28
  ESTIMATED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     623.83
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   10.93
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    6751.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  10
```

```
------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    234.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    572.30
  DOWNSTREAM ELEVATION(FEET) =    570.40
  ELEVATION DIFFERENCE(FEET) =      1.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.74

******************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    236.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  570.40  DOWNSTREAM ELEVATION(FEET) =  502.90
  STREET LENGTH(FEET) =   980.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  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) =       4.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.44
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.61
  STREET FLOW TRAVEL TIME(MIN.) =   3.00   Tc(MIN.) =    5.70
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.691
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.56      SUBAREA RUNOFF(CFS) =    7.55
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       8.22

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  10.97
  FLOW VELOCITY(FEET/SEC.) =  6.22   DEPTH*VELOCITY(FT*FT/SEC.) =   2.15
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    236.00 =    1050.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    236.00 TO NODE    238.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   499.00  DOWNSTREAM(FEET) =   454.00
  FLOW LENGTH(FEET) =   930.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       8.22
  PIPE TRAVEL TIME(MIN.) =   1.35    Tc(MIN.) =    7.04
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    238.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    238.00 TO NODE    238.00 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.) =    7.04
  RAINFALL INTENSITY(INCH/HR) =   4.96
  TOTAL STREAM AREA(ACRES) =     1.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.22

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    242.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    503.90
  DOWNSTREAM ELEVATION(FEET) =    502.60
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.880
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.26
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      1.26

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    238.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  502.60  DOWNSTREAM ELEVATION(FEET) =  467.20
  STREET LENGTH(FEET) =  1020.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  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) =       5.76
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.90
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.41
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.52
  STREET FLOW TRAVEL TIME(MIN.) =   3.85   Tc(MIN.) =    6.73
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.110
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    2.05      SUBAREA RUNOFF(CFS) =    8.90
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.71
  FLOW VELOCITY(FEET/SEC.) =  4.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.99
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    238.00 =    1085.00 FEET.
```

```
 FLOW PROCESS FROM NODE    238.00 TO NODE    238.00 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.) =    6.73
 RAINFALL INTENSITY(INCH/HR) =   5.11
 TOTAL STREAM AREA(ACRES) =     2.29
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.95

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        8.22     7.04        4.964          1.70
     2        9.95     6.73        5.110          2.29

 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       17.81     6.73       5.110
     2       17.89     7.04       4.964

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.89   Tc(MIN.) =    7.04
 TOTAL AREA(ACRES) =        4.0
 LONGEST FLOWPATH FROM NODE    232.00 TO NODE    238.00 =    1980.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    238.00 TO NODE    240.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   464.00  DOWNSTREAM(FEET) =   392.50
 FLOW LENGTH(FEET) =   990.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.23
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.89
 PIPE TRAVEL TIME(MIN.) =   1.02    Tc(MIN.) =    8.06
 LONGEST FLOWPATH FROM NODE    232.00 TO NODE    240.00 =    2970.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 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.) =    8.06
 RAINFALL INTENSITY(INCH/HR) =   4.55
 TOTAL STREAM AREA(ACRES) =     3.99
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.89

****************************************************************************
 FLOW PROCESS FROM NODE    242.00 TO NODE    244.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .6900
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    476.50
 DOWNSTREAM ELEVATION(FEET) =    474.10
 ELEVATION DIFFERENCE(FEET) =      2.40
```

```
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.337
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.77
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.77

****************************************************************************
 FLOW PROCESS FROM NODE    244.00 TO NODE    240.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  474.10  DOWNSTREAM ELEVATION(FEET) =  406.50
 STREET LENGTH(FEET) =  1250.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 16.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
 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) =       8.85
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.36
   HALFSTREET FLOOD WIDTH(FEET) =   11.89
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.78
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.10
 STREET FLOW TRAVEL TIME(MIN.) =   3.60   Tc(MIN.) =    7.94
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.594
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .6900
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
 SUBAREA AREA(ACRES) =    5.02      SUBAREA RUNOFF(CFS) =   15.91
 TOTAL AREA(ACRES) =        5.2        PEAK FLOW RATE(CFS) =      16.48

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.33
 FLOW VELOCITY(FEET/SEC.) =  6.68   DEPTH*VELOCITY(FT*FT/SEC.) =   2.89
 LONGEST FLOWPATH FROM NODE    242.00 TO NODE    240.00 =    1325.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 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.) =    7.94
 RAINFALL INTENSITY(INCH/HR) =   4.59
 TOTAL STREAM AREA(ACRES) =     5.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.48

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       17.89     8.06        4.550          3.99
     2       16.48     7.94        4.594          5.20

 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       34.20     7.94       4.594
     2       34.21     8.06       4.550
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      34.21   Tc(MIN.) =    8.06
  TOTAL AREA(ACRES) =        9.2
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    240.00 =    2970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    242.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   392.50  DOWNSTREAM(FEET) =   391.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.94
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      34.21
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.25
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    242.00 =    3070.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    242.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.25
  RAINFALL INTENSITY(INCH/HR) =   4.48
  TOTAL STREAM AREA(ACRES) =     9.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     34.21

****************************************************************************
  FLOW PROCESS FROM NODE    248.00 TO NODE    250.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    470.00
  DOWNSTREAM ELEVATION(FEET) =    468.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.84
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.84

****************************************************************************
  FLOW PROCESS FROM NODE    250.00 TO NODE    252.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   457.00  DOWNSTREAM(FEET) =   442.00
  FLOW LENGTH(FEET) =   740.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.65
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.84
  PIPE TRAVEL TIME(MIN.) =   2.65    Tc(MIN.) =    6.98
  LONGEST FLOWPATH FROM NODE    248.00 TO NODE    252.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    250.00 TO NODE    252.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.993
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    8.11   SUBAREA RUNOFF(CFS) =   30.37
 TOTAL AREA(ACRES) =        8.3   TOTAL RUNOFF(CFS) =      31.04
 TC(MIN.) =    6.98

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    242.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   442.00  DOWNSTREAM(FEET) =   391.50
 FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  26.95
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      31.04
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    7.14
 LONGEST FLOWPATH FROM NODE    248.00 TO NODE    242.00 =    1075.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    242.00 TO NODE    242.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.14
 RAINFALL INTENSITY(INCH/HR) =   4.92
 TOTAL STREAM AREA(ACRES) =     8.29
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.04

****************************************************************************
 FLOW PROCESS FROM NODE    244.00 TO NODE    246.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .7900
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
 UPSTREAM ELEVATION(FEET) =    413.00
 DOWNSTREAM ELEVATION(FEET) =    412.10
 ELEVATION DIFFERENCE(FEET) =      0.90
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.776
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.88
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.88

****************************************************************************
 FLOW PROCESS FROM NODE    246.00 TO NODE    242.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  412.10  DOWNSTREAM ELEVATION(FEET) =  407.00
 STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 38.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 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) =      10.14
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.40
  HALFSTREET FLOOD WIDTH(FEET) =   13.58
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.58
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
 STREET FLOW TRAVEL TIME(MIN.) =   3.55   Tc(MIN.) =    7.33
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.839
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .7900
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
 SUBAREA AREA(ACRES) =    4.77      SUBAREA RUNOFF(CFS) =   18.24
 TOTAL AREA(ACRES) =        4.9        PEAK FLOW RATE(CFS) =      18.92

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48   HALFSTREET FLOOD WIDTH(FEET) =  17.45
 FLOW VELOCITY(FEET/SEC.) =  2.99   DEPTH*VELOCITY(FT*FT/SEC.) =   1.42
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
        AND L =  550.0 FT WITH ELEVATION-DROP =   5.1 FT, IS   23.3 CFS,
        WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE    242.00
 LONGEST FLOWPATH FROM NODE    244.00 TO NODE    242.00 =     610.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    242.00 TO NODE    242.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.33
 RAINFALL INTENSITY(INCH/HR) =   4.84
 TOTAL STREAM AREA(ACRES) =     4.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.92

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       34.21     8.25        4.484          9.19
     2       31.04     7.14        4.920          8.29
     3       18.92     7.33        4.839          4.95

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       80.67     7.14       4.920
     2       81.15     7.33       4.839
     3       80.03     8.25       4.484

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      81.15   Tc(MIN.) =    7.33
 TOTAL AREA(ACRES) =       22.4
 LONGEST FLOWPATH FROM NODE    232.00 TO NODE    242.00 =    3070.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    242.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   391.50  DOWNSTREAM(FEET) =   305.00
 FLOW LENGTH(FEET) =  1620.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.74
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      81.15
 PIPE TRAVEL TIME(MIN.) =   1.30    Tc(MIN.) =    8.63
 LONGEST FLOWPATH FROM NODE    232.00 TO NODE    190.00 =    4690.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 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       81.15     8.63       4.355       22.43
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    190.00 =    4690.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      623.83    10.93       3.738      208.28
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    6751.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     573.50       8.63        4.355
      2     693.49      10.93        3.738

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     693.49   Tc(MIN.) =   10.93
  TOTAL AREA(ACRES) =      230.7

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    192.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   305.00  DOWNSTREAM(FEET) =   218.00
  FLOW LENGTH(FEET) =  1200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  63.0 INCH PIPE IS  47.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  39.69
  ESTIMATED PIPE DIAMETER(INCH) =  63.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     693.49
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   11.44
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    192.00 =    7951.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.44
  RAINFALL INTENSITY(INCH/HR) =   3.63
  TOTAL STREAM AREA(ACRES) =   230.71
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    693.49

****************************************************************************
  FLOW PROCESS FROM NODE    194.00 TO NODE    196.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    338.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    336.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.490
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.095
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.34   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    192.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   324.00  DOWNSTREAM(FEET) =   218.00
  FLOW LENGTH(FEET) =  1415.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.42
  PIPE TRAVEL TIME(MIN.) =   3.93    Tc(MIN.) =   13.42
  LONGEST FLOWPATH FROM NODE    194.00 TO NODE    192.00 =    1495.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.275
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =   25.38   SUBAREA RUNOFF(CFS) =   24.93
  TOTAL AREA(ACRES) =       25.7   TOTAL RUNOFF(CFS) =      25.27
  TC(MIN.) =   13.42

****************************************************************************
  FLOW PROCESS FROM NODE    193.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.275
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3151
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    2.67
  TOTAL AREA(ACRES) =       27.1   TOTAL RUNOFF(CFS) =      27.94
  TC(MIN.) =   13.42

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.275
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .2000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3068
  SUBAREA AREA(ACRES) =    2.09   SUBAREA RUNOFF(CFS) =    1.37
  TOTAL AREA(ACRES) =       29.2   TOTAL RUNOFF(CFS) =      29.31
  TC(MIN.) =   13.42

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.42
```

```
 RAINFALL INTENSITY(INCH/HR) =   3.27
 TOTAL STREAM AREA(ACRES) =    29.17
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.31

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1      693.49    11.44        3.631        230.71
     2       29.31    13.42        3.275         29.17

 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      718.46    11.44       3.631
     2      654.69    13.42       3.275

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     718.46   Tc(MIN.) =   11.44
 TOTAL AREA(ACRES) =      259.9
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    192.00 =    7951.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    192.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   215.00  DOWNSTREAM(FEET) =   205.00
 FLOW LENGTH(FEET) =   247.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  69.0 INCH PIPE IS  56.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  31.68
 ESTIMATED PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     718.46
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   11.57
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    198.00 =    8198.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.605
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6943
 SUBAREA AREA(ACRES) =    1.08   SUBAREA RUNOFF(CFS) =    2.34
 TOTAL AREA(ACRES) =      261.0   TOTAL RUNOFF(CFS) =     718.46
 TC(MIN.) =   11.57
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.57
 RAINFALL INTENSITY(INCH/HR) =   3.60
 TOTAL STREAM AREA(ACRES) =   260.96
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    718.46

****************************************************************************
 FLOW PROCESS FROM NODE    512.00 TO NODE    514.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
```

```
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    320.00
  ELEVATION DIFFERENCE(FEET) =     50.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.08
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      1.08

****************************************************************************
  FLOW PROCESS FROM NODE    514.00 TO NODE    516.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    320.00  DOWNSTREAM(FEET) =    238.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.1093
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.572
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      38.16
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.31
  AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   1.71
  Tc(MIN.) =    5.89
  SUBAREA AREA(ACRES) =    26.24       SUBAREA RUNOFF(CFS) =   73.11
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.501
  TOTAL AREA(ACRES) =       26.5         PEAK FLOW RATE(CFS) =      74.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.54   FLOW VELOCITY(FEET/SEC.) =   8.93
  LONGEST FLOWPATH FROM NODE    512.00 TO NODE    516.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    513.00 TO NODE    516.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.572
  NORMAL RESIDENTIAL (R1) RUNOFF COEFFICIENT = .6500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5060
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    3.26
  TOTAL AREA(ACRES) =       27.4   TOTAL RUNOFF(CFS) =      77.34
  TC(MIN.) =    5.89

****************************************************************************
  FLOW PROCESS FROM NODE    516.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   228.00  DOWNSTREAM(FEET) =   205.00
  FLOW LENGTH(FEET) =  1000.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.10
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      77.34
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =    6.99
  LONGEST FLOWPATH FROM NODE    512.00 TO NODE    198.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 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.) =    6.99
  RAINFALL INTENSITY(INCH/HR) =   4.99
  TOTAL STREAM AREA(ACRES) =    27.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     77.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      718.46    11.57        3.605        260.96
      2       77.34     6.99        4.988         27.43

  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      596.58     6.99       4.988
      2      774.35    11.57       3.605

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     774.35   Tc(MIN.) =   11.57
  TOTAL AREA(ACRES) =      288.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    198.00 =    8198.00 FEET.

+----------------------------------------------------------------------------+
| MAIN STREET RUNOFF TO VILLAGE 8 WEST                                       |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    559.60
  DOWNSTREAM ELEVATION(FEET) =    557.00
  ELEVATION DIFFERENCE(FEET) =      2.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.717
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.16
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      1.16

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  557.00  DOWNSTREAM ELEVATION(FEET) =  528.00
  STREET LENGTH(FEET) =   900.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 42.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       9.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.36
  STREET FLOW TRAVEL TIME(MIN.) =   3.66   Tc(MIN.) =    6.37
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.294
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    3.73      SUBAREA RUNOFF(CFS) =   16.78
  TOTAL AREA(ACRES) =        4.0        PEAK FLOW RATE(CFS) =      17.77

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.23
  FLOW VELOCITY(FEET/SEC.) =  4.76   DEPTH*VELOCITY(FT*FT/SEC.) =   1.86
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   519.36  DOWNSTREAM(FEET) =   512.54
  FLOW LENGTH(FEET) =   113.26   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.13
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.77
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.50
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    305.00 =    1093.26 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    305.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.228
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8007
  SUBAREA AREA(ACRES) =    3.84   SUBAREA RUNOFF(CFS) =   15.06
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      32.61
  TC(MIN.) =    6.50

+----------------------------------------------------------------------------+
| AREA TRIBUTARY TO BIOFILTRATION BASIN                                      |
| AREA FROM BASIN COMMINGLES WITH VILLAGE 8 WEST                             |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    238.00
  DOWNSTREAM ELEVATION(FEET) =    236.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.490
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.095
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   224.00  DOWNSTREAM(FEET) =   205.20
  FLOW LENGTH(FEET) =   940.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.06
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.21
  PIPE TRAVEL TIME(MIN.) =   5.11    Tc(MIN.) =   14.60
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =    1020.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.101
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =   13.56   SUBAREA RUNOFF(CFS) =   12.62
  TOTAL AREA(ACRES) =       13.7   TOTAL RUNOFF(CFS) =      12.77
  TC(MIN.) =   14.60

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.101
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .2000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.2989
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.09
  TOTAL AREA(ACRES) =       13.9   TOTAL RUNOFF(CFS) =      12.87
  TC(MIN.) =   14.60

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   209.00  DOWNSTREAM(FEET) =   206.00
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.93
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.87
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.63
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =    1050.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    506.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    340.00
  DOWNSTREAM ELEVATION(FEET) =    300.00
  ELEVATION DIFFERENCE(FEET) =     40.00
```

```
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.013
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.181
 SUBAREA RUNOFF(CFS) =      0.90
 TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      0.90

****************************************************************************
 FLOW PROCESS FROM NODE    506.00 TO NODE    508.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    300.00  DOWNSTREAM(FEET) =    240.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   830.00   CHANNEL SLOPE =  0.0723
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.633
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.35
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.90
 AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   2.83
 Tc(MIN.) =    7.84
 SUBAREA AREA(ACRES) =    13.13       SUBAREA RUNOFF(CFS) =   30.42
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
 TOTAL AREA(ACRES) =       13.4         PEAK FLOW RATE(CFS) =      31.09

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   5.96
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    508.00 =     930.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    508.00 TO NODE    513.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   220.00  DOWNSTREAM(FEET) =   212.00
 FLOW LENGTH(FEET) =   500.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.46
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      31.09
 PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =    8.63
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    513.00 =    1430.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    513.00 TO NODE    513.00 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.) =    8.63
 RAINFALL INTENSITY(INCH/HR) =   4.35
 TOTAL STREAM AREA(ACRES) =    13.42
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.09

****************************************************************************
 FLOW PROCESS FROM NODE    509.00 TO NODE    511.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    325.00
 DOWNSTREAM ELEVATION(FEET) =    318.00
 ELEVATION DIFFERENCE(FEET) =      7.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.646
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.725
```

```
  SUBAREA RUNOFF(CFS) =      0.86
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.86

****************************************************************************
  FLOW PROCESS FROM NODE    511.00 TO NODE    513.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    318.00  DOWNSTREAM(FEET) =    222.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   930.00   CHANNEL SLOPE =  0.1032
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.398
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.44
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   2.85
  Tc(MIN.) =    8.50
  SUBAREA AREA(ACRES) =    13.77       SUBAREA RUNOFF(CFS) =   30.28
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       14.1         PEAK FLOW RATE(CFS) =      30.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   6.64
  LONGEST FLOWPATH FROM NODE    509.00 TO NODE    513.00 =    1030.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    513.00 TO NODE    513.00 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.) =    8.50
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =    14.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     30.94

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       31.09     8.63        4.353         13.42
      2       30.94     8.50        4.398         14.07

  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       61.53     8.50       4.398
      2       61.71     8.63       4.353

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      61.71   Tc(MIN.) =    8.63
  TOTAL AREA(ACRES) =       27.5
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    513.00 =    1430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    513.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   212.00  DOWNSTREAM(FEET) =   207.00
  FLOW LENGTH(FEET) =   834.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  29.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.60
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      61.71
 PIPE TRAVEL TIME(MIN.) =   1.62    Tc(MIN.) =   10.25
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    405.00 =    2264.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 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       61.71    10.25       3.897       27.49
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    405.00 =    2264.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       12.87    14.63       3.097       13.88
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =    1050.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      70.72      10.25        3.897
     2      61.92      14.63        3.097

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      70.72   Tc(MIN.) =   10.25
 TOTAL AREA(ACRES) =       41.4

****************************************************************************
 FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   206.00  DOWNSTREAM(FEET) =   180.00
 FLOW LENGTH(FEET) =   740.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.93
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      70.72
 PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   10.98
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    406.00 =    3004.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.98
 RAINFALL INTENSITY(INCH/HR) =   3.73
 TOTAL STREAM AREA(ACRES) =    41.37
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     70.72

****************************************************************************
 FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =   7
----------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
```

```
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  21.39   RAIN INTENSITY(INCH/HOUR) =  2.42
  TOTAL AREA(ACRES) =   181.20   TOTAL RUNOFF(CFS) =    347.24

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 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.) =   21.39
  RAINFALL INTENSITY(INCH/HR) =   2.42
  TOTAL STREAM AREA(ACRES) =   181.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    347.24

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       70.72    10.98        3.728         41.37
      2      347.24    21.39        2.425        181.20

  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      248.97    10.98       3.728
      2      393.24    21.39       2.425

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     393.24   Tc(MIN.) =   21.39
  TOTAL AREA(ACRES) =      222.6
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    406.00 =    3004.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    408.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.425
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7231
  SUBAREA AREA(ACRES) =    1.38   SUBAREA RUNOFF(CFS) =    2.01
  TOTAL AREA(ACRES) =      224.0   TOTAL RUNOFF(CFS) =     393.24
  TC(MIN.) =   21.39
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    518.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.425
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7228
  SUBAREA AREA(ACRES) =    0.54   SUBAREA RUNOFF(CFS) =    0.79
  TOTAL AREA(ACRES) =      224.5   TOTAL RUNOFF(CFS) =     393.42
  TC(MIN.) =   21.39

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.425
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
```

```
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7212
  SUBAREA AREA(ACRES) =    1.58   SUBAREA RUNOFF(CFS) =    1.92
  TOTAL AREA(ACRES) =      226.1   TOTAL RUNOFF(CFS) =     395.34
  TC(MIN.) =   21.39

****************************************************************************
  FLOW PROCESS FROM NODE    511.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.425
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7170
  SUBAREA AREA(ACRES) =    4.35   SUBAREA RUNOFF(CFS) =    5.27
  TOTAL AREA(ACRES) =      230.4   TOTAL RUNOFF(CFS) =     400.61
  TC(MIN.) =   21.39

+--------------------------------------------------------------------------+
| SLOPE RUNOFF TO SR125                                                    |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    600.00
  DOWNSTREAM ELEVATION(FEET) =    590.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.34
  TOTAL AREA(ACRES) =      0.36   TOTAL RUNOFF(CFS) =      1.34

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    590.00  DOWNSTREAM(FEET) =    375.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  3530.00   CHANNEL SLOPE =  0.0609
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.611
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.95
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =  14.89
  Tc(MIN.) =   19.07
  SUBAREA AREA(ACRES) =    12.33       SUBAREA RUNOFF(CFS) =   16.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.503
  TOTAL AREA(ACRES) =       12.7         PEAK FLOW RATE(CFS) =      16.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   4.55
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    3630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   375.00  DOWNSTREAM(FEET) =   335.00
  FLOW LENGTH(FEET) =   874.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.34
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.66
  PIPE TRAVEL TIME(MIN.) =   1.09    Tc(MIN.) =   20.16
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    503.00 =    4504.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    503.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.519
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5021
  SUBAREA AREA(ACRES) =    4.81   SUBAREA RUNOFF(CFS) =    6.06
  TOTAL AREA(ACRES) =       17.5   TOTAL RUNOFF(CFS) =      22.13
  TC(MIN.) =   20.16

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    374.00
  DOWNSTREAM ELEVATION(FEET) =    340.00
  ELEVATION DIFFERENCE(FEET) =     34.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.67

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    340.00  DOWNSTREAM(FEET) =    305.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.0583
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.440
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.38
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   4.19
  Tc(MIN.) =    8.37
  SUBAREA AREA(ACRES) =     1.56       SUBAREA RUNOFF(CFS) =    3.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.510
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       3.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.81
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     700.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.7  TC(MIN.) =      8.37
  PEAK FLOW RATE(CFS)   =       3.94
```

CHAPTER 3

HYDROLOGIC ANALYSIS

3.3 – 50-Year Developed Condition AES Model Output

AES INPUT DATA														
Node #		Code	Elevation		Length	Slope	Area	Soil Type	Land cover	C value	If Channel			If memory
From	To		Up	Down			total				Base (ft)	Z:1	maning	Bank #
101	102	2	574.8	574.1	65	1.08%	0.13	C/D	Dense Residential	0.75				
102	103	3	563.1	554.15	1100	0.81%								
102	103	8					8.66	C/D	Dense Residential	0.75				
103	106	3	554.15	551.8	470	0.50%								
106	106	1												2:1
104	105	2	572.3	571.2	64	1.72%	0.18	D	Roads (88% imp)	0.85	C=0.45 for landscape			
105	106	6	571.2	560	900	1.24%	3.42	D	Roads (88% imp)	0.85	C=0.45 for landscape			
106	106	1												2:2
106	110	3	551.8	490.17	1110	5.55%								
110	110	1												2:1
107	108	2	559.6	557.05	80	3.19%	0.14	D	Roads (88% imp)	0.85	C=0.45 for landscape			
108	110	6	557.05	495	834	7.44%	1.59	D	Roads (88% imp)	0.85	C=0.45 for landscape			
110	110	1												2:2
110	124	3	487	480.8	152	4.08%								
124	124	10												1
112	114	2	518	516.5	75	2.00%	0.20	D	Dense Residential	0.75				
114	116	3	505	489	800	2.00%								
114	116	8					9.39	D	Dense Residential	0.75				
113	116	8					1.38	D	Slopes	0.60				
116	122	3	489	482	560	1.25%								
122	122	1												3:1
118	120	2	503.9	503.1	60	1.33%	0.24	D	Roads (88% imp)	0.85	C=0.45 for landscape			
120	122	6	503.1	493	750	1.35%	2.01	D	Roads (88% imp)	0.85	C=0.45 for landscape			
122	122	1												3:2
123	126	2	516	514.5	75	2.00%	0.17	D	Dense Residential	0.75				
126	122	3	503	482	890	2.36%								
126	122	8					9.63	D	Dense Residential	0.75				
125	122	8					1.29	D	Slopes	0.60				
122	122	1												3:3
122	124	3	482	480.8	120	1.00%								
124	124	11												1
124	124	12												1
124	127	3	480.8	468	344	3.72%								
127	127	1												2:1
128	130	2	501	490.5	100	10.50%	0.22	D	Dense Residential	0.75				
130	127	3	479.5	468	1068	1.08%								
130	127	8					10.06	D	Dense Residential	0.75				
127	127	1												2:2
127	132	3	468	456	400	3.00%								
132	132	1												2:1
134	136	2	493.4	490	84	4.05%	0.18	D	Roads (88% imp)	0.85	C=0.45 for landscape			
136	132	6	490	468	700	3.14%	1.67	D	Roads (88% imp)	0.85	C=0.45 for landscape			
132	132	1												2:2
132	154	3	456	453.8	100	2.20%								
154	154	10												1
138	140	2	485	483.5	75	2.00%	0.17	D	Dense Residential	0.75				
140	141	3	482.5	470	600	2.08%								
140	141	8					5.56	D	Dense Residential	0.75				
141	142	3	470	454	580	2.76%								
142	142	1												3:1
144	146	2	476.5	475.54	64	1.50%	0.18	D	Roads (88% imp)	0.85	C=0.45 for landscape			
146	142	6	475.54	467.14	560	1.50%	1.31	D	Roads (88% imp)	0.85	C=0.45 for landscape			
142	142	1												3:2
135	137	2	483	481.5	75	2.00%	0.11	D	Dense Residential	0.75				
137	139	3	471.5	457	540	2.69%								
137	139	8					4.90	D	Dense Residential	0.75				
139	142	3	457	454	48	6.25%								
142	142	1												3:3
142	154	3	454	451.5	100	2.50%								
154	154													2:1
148	150	2	485	483.5	75	2.00%	0.18	D	Park	0.30				
150	152	3	481.5	463	740	2.50%								
150	152	8					6.58	D	Park	0.30				
152	154	3	463	451.5	200	5.75%								
154	154	1												2:2
154	154	11												1
154	154	12												1
154	158	3	451.5	395.4	840	6.68%								
158	158	1												2:1
154	156	2	465.8	463.8	72	2.78%	0.17	D	Road (88% imp) w/ Slope (43% of area)	0.75	C=0.45 for landscape, 0.60 for slope			
156	158	6	463.8	407.4	811	6.95%	4.16	D	Road (88% imp) w/ Slope (43% of area)	0.75	C=0.45 for landscape, 0.60 for slope			
158	158	1												2:2
158	160	3	395.4	394.2	100	1.20%								
160	160	1												3:1
161	162	2	470	468.5	75	2.00%	0.18	D	Dense Residential	0.75				
162	163	3	457.5	443	800	1.81%								
162	163	8					8.64	D	Dense Residential	0.75				
163	160	3	443	394.2	360	13.56%								
160	160	1												3:2
164	165	2	462	460.5	75	2.00%	0.25	D	Dense Residential	0.75				
165	166	3	449.5	432	800	2.19%								
165	166	8					8.77	D	Dense Residential	0.75				
166	160	3	432	394.2	700	5.40%								
160	160	1												3:3
160	172	3	394.2	365	700	4.17%								
172	172	1												2:1
168	170	2	413	411.8	65	1.85%	0.12	D	Roads (88% imp)	0.85	C=0.45 for landscape			
170	172	6	411.8	381.8	850	3.53%	1.50	D	Roads (88% imp)	0.85	C=0.45 for landscape			
172	172	1												2:2
172	172	10												1

200	202	2	506	504.5	75	2.00%	0.21	D	Dense Residential	0.75				
202	204	3	493.5	479	770	1.88%								
202	204	8					8.99	D	Dense Residential	0.75				
201	206	8					1.22	D	Slope	0.60				
204	206	3	479	470	530	1.70%								
206	206	1												3:1
208	210	2	503.5	502	75	2.00%	0.17	D	Dense Residential	0.75				
210	206	3	491	470	760	2.76%								
210	206	8					9.40	D	Dense Residential	0.75				
207	206	8					0.39	D	Slope	0.60				
206	206	1												3:2
212	214	2	493.4	492.5	60	1.50%	0.21	D	Roads (88% imp)	0.85	C=0.45 for landscape			
214	206	6	492.5	480.9	925	1.25%	1.95	D	Roads (88% imp)	0.85	C=0.45 for landscape			
206	206	1												3:3
206	213	3	470	430	900	4.44%								
213	213	1												2:1
211	212	2	481.9	479.4	78	3.21%	0.22	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
212	213	6	479.4	440.3	760	5.14%	2.34	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
213	213	1												2:2
213	215	3	430	429.3	65	1.08%								
215	215	1												3:1
216	218	2	486	484.5	75	2.00%	0.18	D	School	0.80				
218	220	3	473.5	457.5	810	1.98%								
218	220	8					9.84	D	School	0.80				
220	215	3	457.5	429.3	220	12.82%								
215	215	1												3:2
222	224	2	465.8	463.2	80	3.25%	0.26	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
224	215	6	463.2	440.9	1020	2.19%	2.78	D	Road (88% imp) w/ Slope (21% of area)	0.80	C=0.45 for landscape, 0.60 for slope			
215	215	1												3:3
215	226	3	429.3	420	774	1.20%								
226	226	1												2:1
228	230	2	451	449	75	2.67%	0.18	D	Dense Residential	0.75				
230	226	3	438	420	790	2.28%								
230	226	8					9.99	D	Dense Residential	0.75				
226	226	1												2:2
226	258	3	420	380	180	22.22%								
258	258	1												2:1
254	256	2	408.5	407.2	65	2.00%	0.18	D	Road (88% imp) w/ Slope (30% of area)	0.78	C=0.45 for landscape, 0.60 for slope			
256	258	6	407.2	388.3	1060	1.78%	4.88	D	Road (88% imp) w/ Slope (30% of area)	0.78	C=0.45 for landscape, 0.60 for slope			
259	258	8					3.22	D	Road (88% imp) w/ Slope (30% of area)	0.78	C=0.45 for landscape, 0.60 for slope			
258	258	1												2:2
258	172	3	380	365	1700	0.88%								
172	172	11												1
172	172	12												1
172	174	3	365	358	530	1.32%								
174	174	1												3:1
176	178	2	390	388.5	75	2.00%	0.16	D	Dense Residential	0.75				
178	180	3	377.5	369	750	1.13%								
178	180	8					15.87	D	Dense Residential	0.75				
180	174	3	369	358	760	1.45%								
180	174	8					16.23	D	Dense Residential	0.75				
174	174	1												3:2
182	184	2	405	387	100	18.00%	0.16	D	Dense Residential	0.75				
184	186	3	376	369	800	0.88%								
184	186	8					13.09	D	Dense Residential	0.75				
186	174	3	369	358	630	1.75%								
186	174	8					11.60	D	Dense Residential	0.75				
174	174	1												3:3
174	188	3	358	355	180	1.67%								
188	188	8					1.22	D	Park	0.30				
188	190	3	355	305	660	7.58%								
190	190	10												1

232	234	2	572.3	570.4	70	2.71%	0.14	D	Roads (88% imp)	0.85	C=0.45 for landscape			
234	236	6	570.4	502.9	980	6.89%	1.56	D	Roads (88% imp)	0.85	C=0.45 for landscape			
236	238	3	499	454	930	4.84%								
238	238	1												2:1
240	242	2	503.9	502.6	65	2.00%	0.24	D	Roads (88% imp)	0.85	C=0.45 for landscape			
242	238	6	502.6	467.2	1020	3.47%	2.05	D	Roads (88% imp)	0.85	C=0.45 for landscape			
238	238	1												2:2
238	240	3	464	392.5	990	7.22%								
240	240	1												2:1
242	244	2	476.5	474.1	75	3.20%	0.18	D	Road (88% imp) w/ Slope (18% of area) and additional lanscape (28% of area)	0.69	C=0.45 for landscape, 0.60 for slope			
244	240	6	474.1	406.5	1250	5.41%	5.02	D	Road (88% imp) w/ Slope (18% of area) and additional lanscape (28% of area)	0.69	C=0.45 for landscape, 0.60 for slope			
240	240	1												2:2
240	242	3	392.5	391.5	100	1.00%								
242	242	1												3:1
248	250	2	470	468.5	75	2.00%	0.18	D	Dense Residential	0.75				
250	252	3	457	442	740	2.03%								
250	252	8					8.11	D	Dense Residential	0.75				
252	242	3	442	391.5	260	19.42%								
242	242	1												3:2
244	246	2	413	412.1	60	1.50%	0.18	D	Road (88% imp) w/ Slope (25% of area)	0.79	C=0.45 for landscape, 0.60 for slope			
246	242	6	412.1	407	550	0.93%	4.77	D	Road (88% imp) w/ Slope (25% of area)	0.79	C=0.45 for landscape, 0.60 for slope			
242	242	1												3:3
242	190	3	391.5	305	1620	5.34%								
190	190	11												1
190	190	12												1
190	192	3	305	218	1200	7.25%								
192	192	1												2:1
194	196	2	338	336	80	2.50%	0.34	D	Park	0.30				
196	192	3	324	218	1415	7.49%								
196	192	8					25.38	D	Park	0.30				
193	192	8					1.36	D	Slopes & Access Road	0.60				
192	192	8					2.09	A	Basin	0.20				
192	192	1												2:2
192	198	3	215	205	248	4.03%								
198	198	8					1.08	D	Slopes	0.60				
198	198	1												2:1
512	514	2	370	320	100	50.00%	0.29	D	Slopes	0.60				
514	516	5	320	238	750	10.93%	26.24	D	Slopes-Rolling	0.50				
513	516	8					0.9		Normal Residential	0.65				
516	198	3	228	205	1000	2.30%								
198	198	1												2:2
							288.39							
300	302	2	559.6	557	80	3.25%	0.22	D	Roads (88% imp)	0.85	C=0.45 for landscape			
302	304	6	557	528	900	3.22%	3.73	D	Roads (88% imp)	0.85	C=0.45 for landscape			
304	305	3	519.36	512.54	113.26	6.02%								
306	305	8					3.84	D	Existing Road	0.75				
							7.79							
400	402	2	238	236	80	2.50%	0.17	D	Park	0.30				
402	404	3	224	205.2	940	2.00%								
402	404	8					13.56	D	Park	0.30				
404	404	8					0.15	A	Basin	0.20				
404	405	3	209	206	30	10.00%								
405	405	10												1
504	506	2	340	300	100	40.00%	0.29	D	Slopes-Rolling	0.50				
506	507	5	300	240	830	7.23%	13.13	D	Slopes-Rolling	0.50				
507	513	3	220	212	500	1.60%								
513	513	1												2:1
509	511	2	325	318	100	7.00%	0.3	D	Slopes-Rolling	0.50				
511	513	5	318	222	930	10.32%	13.77	D	Slopes-Rolling	0.50				
513	513	1												2:2
513	405	3	212	207	834	0.60%								
405	405	11												1
405	405	12												1
405	406	3	206	180	740	3.51%								
406	406	1												2:1
			EVENT	Q (CFS)	A (AC)	TC (MIN)	EVENT	Q (CFS)	A (AC)	TC (MIN)				
406	406	7	100-YR	347.24	181.2	21.39	50-YR	306.14	181.2	21.52				2:2
406	406	1												
408	406	8					1.38	D	Slopes	0.60				1
518	406	8					0.54	D	Slopes	0.60				
510	406	8					1.58	D	Slopes	0.60				
511	406	8					4.35	D	Slopes-Rolling	0.50				
							230.42	+181.2						
500	501	2	600	590	100	10.00%	0.36	D	Slopes	0.60				
501	502	5	590	375	3530	6.09%	12.33	D	Slopes-rolling	0.50				
502	503	3	375	335	874									
503	503	8					4.81	D	Slopes-rolling	0.50				
							17.5							
600	601	2	374	340	100	34.00%	0.18	D	Slopes	0.60				
601	602	5	340	305	600	5.83%	1.56	D	Slopes	0.60				
							1.74							
						Total Area	545.84							

Nodes with land use labeled as "Roads"are composed by road, median landscape, parkways, and lanscape buffers and have an assumed 88% imperviousnes. This number will be reconciled during final engineering. Nodes 242-244 have additional lanscape not accounted for by the street cross sections defined in the TM. This series has a lower runoff coefficient when compared to other similar series due to 1.45 acres of landscape that are not covered as "parkways, or landscape buffers" that drain into the streets.

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

            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 *************************
* Otay Ranch Village 8 East                                             *
* 50-Year Developed Condition                                           *
* DLN: 0920, W.O. 2395-0039                                             *
 **************************************************************************

  FILE NAME: R:\0920\HYD\TM\DR\CALCS\AES\50PR.DAT
  TIME/DATE OF STUDY: 08:50 09/15/2023
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.150
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  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   42.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   38.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   24.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   25.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   25.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   16.0      9.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  7   12.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  8   20.0     10.0    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 =  0.50 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.*

+------------------------------------------------------------------------+
| AREA TRIBUTARY TO DETENTION BASIN                                      |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    574.80
```

```
  DOWNSTREAM ELEVATION(FEET) =    574.10
  ELEVATION DIFFERENCE(FEET) =      0.70
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.955
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   563.10  DOWNSTREAM(FEET) =   554.15
  FLOW LENGTH(FEET) =  1100.00   MANNING'S N =  0.012
  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.) =   2.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.55
  PIPE TRAVEL TIME(MIN.) =   6.14    Tc(MIN.) =   11.09
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =    1165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.388
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.66   SUBAREA RUNOFF(CFS) =   22.00
  TOTAL AREA(ACRES) =        8.8   TOTAL RUNOFF(CFS) =      22.33
  TC(MIN.) =   11.09

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 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) =   554.15  DOWNSTREAM(FEET) =   551.80
  FLOW LENGTH(FEET) =   470.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.24
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.33
  PIPE TRAVEL TIME(MIN.) =   1.25    Tc(MIN.) =   12.35
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.35
  RAINFALL INTENSITY(INCH/HR) =   3.16
  TOTAL STREAM AREA(ACRES) =     8.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.33

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =    572.30
  DOWNSTREAM ELEVATION(FEET) =    571.20
  ELEVATION DIFFERENCE(FEET) =      1.10
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.005
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  571.20  DOWNSTREAM ELEVATION(FEET) =  560.00
  STREET LENGTH(FEET) =   900.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 42.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       6.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.83
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
  STREET FLOW TRAVEL TIME(MIN.) =   5.71   Tc(MIN.) =    8.72
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.957
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    3.42      SUBAREA RUNOFF(CFS) =   11.50
  TOTAL AREA(ACRES) =        3.6        PEAK FLOW RATE(CFS) =      12.11

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.79
  FLOW VELOCITY(FEET/SEC.) =  3.00   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
  LONGEST FLOWPATH FROM NODE    104.00 TO NODE    106.00 =     964.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.72
  RAINFALL INTENSITY(INCH/HR) =   3.96
  TOTAL STREAM AREA(ACRES) =     3.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.11

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       22.33    12.35        3.162          8.79
      2       12.11     8.72        3.957          3.60

  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       27.88     8.72       3.957
      2       32.01    12.35       3.162

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      32.01   Tc(MIN.) =   12.35
  TOTAL AREA(ACRES) =       12.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    106.00 =    1635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   551.80  DOWNSTREAM(FEET) =   490.17
  FLOW LENGTH(FEET) =  1110.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.67
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.01
  PIPE TRAVEL TIME(MIN.) =   1.11    Tc(MIN.) =   13.46
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    110.00 =    2745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.46
  RAINFALL INTENSITY(INCH/HR) =   2.99
  TOTAL STREAM AREA(ACRES) =    12.39
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     32.01

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    559.60
  DOWNSTREAM ELEVATION(FEET) =    557.05
  ELEVATION DIFFERENCE(FEET) =      2.55
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.735
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.67

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  557.05  DOWNSTREAM ELEVATION(FEET) =  495.00
  STREET LENGTH(FEET) =   834.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       4.21
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.68
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.15
  STREET FLOW TRAVEL TIME(MIN.) =   2.91   Tc(MIN.) =    5.64
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.240
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.59      SUBAREA RUNOFF(CFS) =    7.08
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       7.71

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.74
  FLOW VELOCITY(FEET/SEC.) =  5.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.51
  LONGEST FLOWPATH FROM NODE    107.00 TO NODE    110.00 =     914.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 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.) =    5.64
  RAINFALL INTENSITY(INCH/HR) =   5.24
  TOTAL STREAM AREA(ACRES) =     1.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.71

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       32.01    13.46        2.991         12.39
      2        7.71     5.64        5.240          1.73

  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       25.98     5.64       5.240
      2       36.41    13.46       2.991

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.41   Tc(MIN.) =   13.46
  TOTAL AREA(ACRES) =       14.1
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    110.00 =    2745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 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) =   487.00  DOWNSTREAM(FEET) =   480.80
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.46
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.41
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =   13.62
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    124.00 =    2897.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  10
```

```
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    114.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    518.00
  DOWNSTREAM ELEVATION(FEET) =    516.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  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) =   505.00  DOWNSTREAM(FEET) =   489.00
  FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
  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.) =   4.66
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.85
  PIPE TRAVEL TIME(MIN.) =   2.86    Tc(MIN.) =    7.19
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    116.00 =     875.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.481
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    9.39   SUBAREA RUNOFF(CFS) =   31.56
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =      32.23
  TC(MIN.) =    7.19

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.481
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7311
  SUBAREA AREA(ACRES) =    1.38   SUBAREA RUNOFF(CFS) =    3.71
  TOTAL AREA(ACRES) =       11.0   TOTAL RUNOFF(CFS) =      35.94
  TC(MIN.) =    7.19

****************************************************************************
  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) =   489.00  DOWNSTREAM(FEET) =   482.00
  FLOW LENGTH(FEET) =   560.00   MANNING'S N =  0.013
```

```
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.90
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      35.94
 PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =    8.13
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    122.00 =    1435.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.13
 RAINFALL INTENSITY(INCH/HR) =   4.14
 TOTAL STREAM AREA(ACRES) =    10.97
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.94

****************************************************************************
 FLOW PROCESS FROM NODE    118.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .8500
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
 UPSTREAM ELEVATION(FEET) =    503.90
 DOWNSTREAM ELEVATION(FEET) =    503.10
 ELEVATION DIFFERENCE(FEET) =      0.80
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.167
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      1.16
 TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      1.16

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  5 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.10  DOWNSTREAM ELEVATION(FEET) =  493.00
 STREET LENGTH(FEET) =   750.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  18.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 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) =       4.75
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.31
   HALFSTREET FLOOD WIDTH(FEET) =    9.14
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.49
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.77
 STREET FLOW TRAVEL TIME(MIN.) =   5.03   Tc(MIN.) =    8.19
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.119
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .8500
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 SUBAREA AREA(ACRES) =    2.01      SUBAREA RUNOFF(CFS) =    7.04
 TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =       7.88

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.39
```

```
 FLOW VELOCITY(FEET/SEC.) =  2.78   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
 LONGEST FLOWPATH FROM NODE    118.00 TO NODE    122.00 =     810.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.19
 RAINFALL INTENSITY(INCH/HR) =   4.12
 TOTAL STREAM AREA(ACRES) =     2.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.88

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    126.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    516.00
 DOWNSTREAM ELEVATION(FEET) =    514.50
 ELEVATION DIFFERENCE(FEET) =      1.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.72
 TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
 FLOW PROCESS FROM NODE    126.00 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) =   503.00  DOWNSTREAM(FEET) =   482.00
 FLOW LENGTH(FEET) =   890.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.68
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.72
 PIPE TRAVEL TIME(MIN.) =   3.17    Tc(MIN.) =    7.50
 LONGEST FLOWPATH FROM NODE    123.00 TO NODE    122.00 =     965.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    126.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.362
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    9.63   SUBAREA RUNOFF(CFS) =   31.51
 TOTAL AREA(ACRES) =        9.8   TOTAL RUNOFF(CFS) =      32.06
 TC(MIN.) =    7.50

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.362
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7326
 SUBAREA AREA(ACRES) =    1.29   SUBAREA RUNOFF(CFS) =    3.38
```

```
 TOTAL AREA(ACRES) =       11.1   TOTAL RUNOFF(CFS) =      35.44
 TC(MIN.) =    7.50

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.50
 RAINFALL INTENSITY(INCH/HR) =   4.36
 TOTAL STREAM AREA(ACRES) =    11.09
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.44

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       35.94     8.13        4.139         10.97
     2        7.88     8.19        4.119          2.25
     3       35.44     7.50        4.362         11.09

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       75.78     7.50       4.362
     2       77.39     8.13       4.139
     3       77.12     8.19       4.119

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      77.39   Tc(MIN.) =    8.13
 TOTAL AREA(ACRES) =       24.3
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    122.00 =    1435.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 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) =   482.00  DOWNSTREAM(FEET) =   480.80
 FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  31.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.76
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      77.39
 PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.32
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    124.00 =    1555.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 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       77.39     8.32       4.079       24.31
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    124.00 =    1555.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       36.41    13.62       2.968       14.12
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    124.00 =    2897.00 FEET.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      99.62       8.32        4.079
      2      92.71      13.62        2.968

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      99.62   Tc(MIN.) =    8.32
  TOTAL AREA(ACRES) =       38.4

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   480.80  DOWNSTREAM(FEET) =   468.00
  FLOW LENGTH(FEET) =   344.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.25
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      99.62
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    8.62
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    127.00 =    3241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 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.) =    8.62
  RAINFALL INTENSITY(INCH/HR) =   3.99
  TOTAL STREAM AREA(ACRES) =    38.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     99.62

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    501.00
  DOWNSTREAM ELEVATION(FEET) =    490.50
  ELEVATION DIFFERENCE(FEET) =     10.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.924
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.93
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      0.93

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.50  DOWNSTREAM(FEET) =   468.00
  FLOW LENGTH(FEET) =  1068.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.5 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.93
  PIPE TRAVEL TIME(MIN.) =   4.63    Tc(MIN.) =    7.56
  LONGEST FLOWPATH FROM NODE    128.00 TO NODE    127.00 =    1168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.340
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   10.06   SUBAREA RUNOFF(CFS) =   32.75
  TOTAL AREA(ACRES) =       10.3   TOTAL RUNOFF(CFS) =      33.46
  TC(MIN.) =    7.56

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 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.) =    7.56
  RAINFALL INTENSITY(INCH/HR) =   4.34
  TOTAL STREAM AREA(ACRES) =    10.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     33.46

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       99.62     8.62        3.988         38.43
      2       33.46     7.56        4.340         10.28

  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      120.82     7.56       4.340
      2      130.37     8.62       3.988

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     130.37   Tc(MIN.) =    8.62
  TOTAL AREA(ACRES) =       48.7
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    127.00 =    3241.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 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) =   468.00  DOWNSTREAM(FEET) =   456.00
  FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  30.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.63
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     130.37
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    8.97
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    132.00 =    3641.00 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.) =    8.97
  RAINFALL INTENSITY(INCH/HR) =   3.88
  TOTAL STREAM AREA(ACRES) =    48.71
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    130.37

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    84.00
  UPSTREAM ELEVATION(FEET) =    493.40
  DOWNSTREAM ELEVATION(FEET) =    490.00
  ELEVATION DIFFERENCE(FEET) =      3.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.588
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    132.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  490.00  DOWNSTREAM ELEVATION(FEET) =  468.00
  STREET LENGTH(FEET) =   700.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       4.46
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.43
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
  STREET FLOW TRAVEL TIME(MIN.) =   3.40   Tc(MIN.) =    5.99
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.042
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.67      SUBAREA RUNOFF(CFS) =    7.16
  TOTAL AREA(ACRES) =        1.8        PEAK FLOW RATE(CFS) =       7.93

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.54
  FLOW VELOCITY(FEET/SEC.) =  3.85   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE    134.00 TO NODE    132.00 =     784.00 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.) =    5.99
  RAINFALL INTENSITY(INCH/HR) =   5.04
  TOTAL STREAM AREA(ACRES) =     1.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.93

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      130.37     8.97        3.884         48.71
      2        7.93     5.99        5.042          1.85

  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      108.37     5.99       5.042
      2      136.48     8.97       3.884

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     136.48   Tc(MIN.) =    8.97
  TOTAL AREA(ACRES) =       50.6
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    132.00 =    3641.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    154.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   456.00  DOWNSTREAM(FEET) =   453.80
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  33.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.76
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     136.48
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.07
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    154.00 =    3741.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    140.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    485.00
  DOWNSTREAM ELEVATION(FEET) =    483.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.50  DOWNSTREAM(FEET) =   454.00
  FLOW LENGTH(FEET) =  1100.00   MANNING'S N =  0.012
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.84
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.72
  PIPE TRAVEL TIME(MIN.) =   3.79    Tc(MIN.) =    8.12
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    141.00 =    1175.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.143
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    5.56   SUBAREA RUNOFF(CFS) =   17.28
  TOTAL AREA(ACRES) =        5.7   TOTAL RUNOFF(CFS) =      17.80
  TC(MIN.) =    8.12

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   470.00  DOWNSTREAM(FEET) =   454.00
  FLOW LENGTH(FEET) =   580.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.27
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.80
  PIPE TRAVEL TIME(MIN.) =   0.86    Tc(MIN.) =    8.98
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    142.00 =    1755.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.98
  RAINFALL INTENSITY(INCH/HR) =   3.88
  TOTAL STREAM AREA(ACRES) =     5.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.80

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    146.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =    476.50
  DOWNSTREAM ELEVATION(FEET) =    475.38
  ELEVATION DIFFERENCE(FEET) =      1.12
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.987
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    142.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =  475.38  DOWNSTREAM ELEVATION(FEET) =  466.98
  STREET LENGTH(FEET) =   560.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       3.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.40
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.68
  STREET FLOW TRAVEL TIME(MIN.) =   3.88   Tc(MIN.) =    6.87
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.615
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.31      SUBAREA RUNOFF(CFS) =    5.14
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       5.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.74
  FLOW VELOCITY(FEET/SEC.) =  2.74   DEPTH*VELOCITY(FT*FT/SEC.) =   0.88
  LONGEST FLOWPATH FROM NODE    144.00 TO NODE    142.00 =     624.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.87
  RAINFALL INTENSITY(INCH/HR) =   4.62
  TOTAL STREAM AREA(ACRES) =     1.49
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.85

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    137.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    483.00
  DOWNSTREAM ELEVATION(FEET) =    481.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    139.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   471.50  DOWNSTREAM(FEET) =   457.00
  FLOW LENGTH(FEET) =   540.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.1 INCHES
```

```
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.10
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.47
 PIPE TRAVEL TIME(MIN.) =   2.19    Tc(MIN.) =    6.53
 LONGEST FLOWPATH FROM NODE    135.00 TO NODE    139.00 =     615.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    137.00 TO NODE    139.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.771
 *USER SPECIFIED(SUBAREA):
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    4.90   SUBAREA RUNOFF(CFS) =   17.53
 TOTAL AREA(ACRES) =        5.0   TOTAL RUNOFF(CFS) =      17.93
 TC(MIN.) =    6.53

****************************************************************************
 FLOW PROCESS FROM NODE    139.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   457.00  DOWNSTREAM(FEET) =   454.00
 FLOW LENGTH(FEET) =    48.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.34
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.93
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    6.58
 LONGEST FLOWPATH FROM NODE    135.00 TO NODE    142.00 =     663.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.58
 RAINFALL INTENSITY(INCH/HR) =   4.75
 TOTAL STREAM AREA(ACRES) =     5.01
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.93

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       17.80     8.98        3.883          5.73
     2        5.85     6.87        4.615          1.49
     3       17.93     6.58        4.746          5.01

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       36.57     6.58       4.746
     2       36.90     6.87       4.615
     3       37.39     8.98       3.883

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      37.39   Tc(MIN.) =    8.98
 TOTAL AREA(ACRES) =       12.2
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    142.00 =    1755.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    154.00 IS CODE =  31
```

```
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   454.00  DOWNSTREAM(FEET) =   451.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.99
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      37.39
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    9.11
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1855.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 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.) =    9.11
  RAINFALL INTENSITY(INCH/HR) =   3.85
  TOTAL STREAM AREA(ACRES) =    12.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     37.39

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    150.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    485.00
  DOWNSTREAM ELEVATION(FEET) =    483.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.898
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.646
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    152.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   481.50  DOWNSTREAM(FEET) =   463.00
  FLOW LENGTH(FEET) =   740.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.20
  PIPE TRAVEL TIME(MIN.) =   3.82    Tc(MIN.) =   13.72
  LONGEST FLOWPATH FROM NODE    148.00 TO NODE    152.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    152.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.954
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =    6.58   SUBAREA RUNOFF(CFS) =    5.83
  TOTAL AREA(ACRES) =        6.8   TOTAL RUNOFF(CFS) =       5.99
  TC(MIN.) =   13.72

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

```
 FLOW PROCESS FROM NODE    152.00 TO NODE    154.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   463.00  DOWNSTREAM(FEET) =   451.50
 FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.25
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.99
 PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   14.01
 LONGEST FLOWPATH FROM NODE    148.00 TO NODE    154.00 =    1015.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 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.) =   14.01
 RAINFALL INTENSITY(INCH/HR) =   2.91
 TOTAL STREAM AREA(ACRES) =     6.76
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.99

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       37.39     9.11        3.848         12.23
     2        5.99    14.01        2.914          6.76

 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       41.28     9.11       3.848
     2       34.31    14.01       2.914

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      41.28   Tc(MIN.) =    9.11
 TOTAL AREA(ACRES) =       19.0
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1855.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    154.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   454.00  DOWNSTREAM(FEET) =   451.50
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.20
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      41.28
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    9.23
 LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1955.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 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       41.28     9.23       3.814       18.99
  LONGEST FLOWPATH FROM NODE    138.00 TO NODE    154.00 =    1955.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      136.48     9.07       3.857       50.56
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    154.00 =    3741.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     177.04       9.07        3.857
      2     176.23       9.23        3.814

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     177.04   Tc(MIN.) =    9.07
  TOTAL AREA(ACRES) =       69.5

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    154.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    158.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   451.50  DOWNSTREAM(FEET) =   395.40
  FLOW LENGTH(FEET) =   840.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.51
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     177.04
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    9.58
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    158.00 =    4581.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    158.00 TO NODE    158.00 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.) =    9.58
  RAINFALL INTENSITY(INCH/HR) =   3.72
  TOTAL STREAM AREA(ACRES) =    69.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    177.04

****************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    156.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =    465.80
  DOWNSTREAM ELEVATION(FEET) =    463.80
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.803
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.72

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

```
 FLOW PROCESS FROM NODE    156.00 TO NODE    158.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  463.80  DOWNSTREAM ELEVATION(FEET) =  407.40
 STREET LENGTH(FEET) =   811.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 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) =       8.38
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.29
   HALFSTREET FLOOD WIDTH(FEET) =    8.19
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.30
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.54
 STREET FLOW TRAVEL TIME(MIN.) =   2.55   Tc(MIN.) =    6.35
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.855
 *USER SPECIFIED(SUBAREA):
 PAVED SURFACE RUNOFF COEFFICIENT = .7500
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
 SUBAREA AREA(ACRES) =    4.16      SUBAREA RUNOFF(CFS) =   15.15
 TOTAL AREA(ACRES) =        4.3        PEAK FLOW RATE(CFS) =      15.77

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.80
 FLOW VELOCITY(FEET/SEC.) =  6.14   DEPTH*VELOCITY(FT*FT/SEC.) =   2.10
 LONGEST FLOWPATH FROM NODE    154.00 TO NODE    158.00 =     883.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    158.00 TO NODE    158.00 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.) =    6.35
 RAINFALL INTENSITY(INCH/HR) =   4.85
 TOTAL STREAM AREA(ACRES) =     4.33
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.77

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1      177.04     9.58        3.724         69.55
     2       15.77     6.35        4.855          4.33

 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      133.11     6.35       4.855
     2      189.13     9.58       3.724

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     189.13   Tc(MIN.) =    9.58
 TOTAL AREA(ACRES) =       73.9
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    158.00 =    4581.00 FEET.

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

```
 FLOW PROCESS FROM NODE    158.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.40  DOWNSTREAM(FEET) =   394.20
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  54.0 INCH PIPE IS  41.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.59
 ESTIMATED PIPE DIAMETER(INCH) =  54.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     189.13
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.70
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =    4681.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.70
 RAINFALL INTENSITY(INCH/HR) =   3.70
 TOTAL STREAM AREA(ACRES) =    73.88
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    189.13

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
 UPSTREAM ELEVATION(FEET) =    470.00
 DOWNSTREAM ELEVATION(FEET) =    468.50
 ELEVATION DIFFERENCE(FEET) =      1.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.76
 TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.76

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   457.50  DOWNSTREAM(FEET) =   443.00
 FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.35
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.76
 PIPE TRAVEL TIME(MIN.) =   3.06    Tc(MIN.) =    7.39
 LONGEST FLOWPATH FROM NODE    161.00 TO NODE    163.00 =     875.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.402
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    8.64   SUBAREA RUNOFF(CFS) =   28.52
 TOTAL AREA(ACRES) =        8.8   TOTAL RUNOFF(CFS) =      29.12
 TC(MIN.) =    7.39
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    163.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   443.00  DOWNSTREAM(FEET) =   394.20
  FLOW LENGTH(FEET) =   360.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.56
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.12
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    7.64
  LONGEST FLOWPATH FROM NODE    161.00 TO NODE    160.00 =    1235.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.64
  RAINFALL INTENSITY(INCH/HR) =   4.31
  TOTAL STREAM AREA(ACRES) =     8.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.12

****************************************************************************
  FLOW PROCESS FROM NODE    164.00 TO NODE    165.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    462.00
  DOWNSTREAM ELEVATION(FEET) =    460.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.06
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.06

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    166.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   449.50  DOWNSTREAM(FEET) =   432.00
  FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.13
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.06
  PIPE TRAVEL TIME(MIN.) =   2.60    Tc(MIN.) =    6.93
  LONGEST FLOWPATH FROM NODE    164.00 TO NODE    166.00 =     875.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    166.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.589
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.77   SUBAREA RUNOFF(CFS) =   30.18
```

```
  TOTAL AREA(ACRES) =        9.0   TOTAL RUNOFF(CFS) =      31.04
  TC(MIN.) =    6.93

****************************************************************************
  FLOW PROCESS FROM NODE    166.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   432.00  DOWNSTREAM(FEET) =   394.20
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.41
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      31.04
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =    7.64
  LONGEST FLOWPATH FROM NODE    164.00 TO NODE    160.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.64
  RAINFALL INTENSITY(INCH/HR) =   4.31
  TOTAL STREAM AREA(ACRES) =     9.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.04

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      189.13     9.70        3.695         73.88
      2       29.12     7.64        4.311          8.82
      3       31.04     7.64        4.309          9.02

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      222.27     7.64       4.311
      2      222.36     7.64       4.309
      3      240.72     9.70       3.695

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     240.72   Tc(MIN.) =    9.70
  TOTAL AREA(ACRES) =       91.7
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    160.00 =    4681.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    172.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   394.20  DOWNSTREAM(FEET) =   365.00
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  34.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.93
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     240.72
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   10.16
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    172.00 =    5381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.16
  RAINFALL INTENSITY(INCH/HR) =   3.58
  TOTAL STREAM AREA(ACRES) =    91.72
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    240.72

********************************************************************************
  FLOW PROCESS FROM NODE    168.00 TO NODE    170.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    413.00
  DOWNSTREAM ELEVATION(FEET) =    411.80
  ELEVATION DIFFERENCE(FEET) =      1.20
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.957
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.58

********************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    172.00 IS CODE =  62
--------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  411.80  DOWNSTREAM ELEVATION(FEET) =  381.80
  STREET LENGTH(FEET) =   850.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       3.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   4.20   Tc(MIN.) =    7.16
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.495
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    5.73
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       6.19

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.28
  FLOW VELOCITY(FEET/SEC.) =  3.85   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE    168.00 TO NODE    172.00 =     915.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 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.) =    7.16
  RAINFALL INTENSITY(INCH/HR) =   4.50
  TOTAL STREAM AREA(ACRES) =     1.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.19

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      240.72    10.16        3.585         91.72
      2        6.19     7.16        4.495          1.62

  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      198.13     7.16       4.495
      2      245.65    10.16       3.585

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     245.65   Tc(MIN.) =   10.16
  TOTAL AREA(ACRES) =       93.3
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    172.00 =    5381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    506.00
  DOWNSTREAM ELEVATION(FEET) =    504.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.89
  TOTAL AREA(ACRES) =      0.21   TOTAL RUNOFF(CFS) =      0.89

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   493.50  DOWNSTREAM(FEET) =   479.00
  FLOW LENGTH(FEET) =   770.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.62
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.89
  PIPE TRAVEL TIME(MIN.) =   2.78    Tc(MIN.) =    7.11
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     845.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.515
```

```
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.99   SUBAREA RUNOFF(CFS) =   30.44
  TOTAL AREA(ACRES) =        9.2   TOTAL RUNOFF(CFS) =      31.15
  TC(MIN.) =    7.11

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.515
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7324
  SUBAREA AREA(ACRES) =    1.22   SUBAREA RUNOFF(CFS) =    3.30
  TOTAL AREA(ACRES) =       10.4   TOTAL RUNOFF(CFS) =      34.46
  TC(MIN.) =    7.11

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   501.40  DOWNSTREAM(FEET) =   470.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.30
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      34.46
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    7.62
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1375.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.62
  RAINFALL INTENSITY(INCH/HR) =   4.32
  TOTAL STREAM AREA(ACRES) =    10.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     34.46

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    503.50
  DOWNSTREAM ELEVATION(FEET) =    502.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    206.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.00  DOWNSTREAM(FEET) =   470.00
```

```
  FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.95
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.72
  PIPE TRAVEL TIME(MIN.) =   2.56    Tc(MIN.) =    6.89
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    206.00 =     835.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.607
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    9.40   SUBAREA RUNOFF(CFS) =   32.48
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =      33.07
  TC(MIN.) =    6.89

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.607
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7441
  SUBAREA AREA(ACRES) =    0.39   SUBAREA RUNOFF(CFS) =    1.08
  TOTAL AREA(ACRES) =       10.0   TOTAL RUNOFF(CFS) =      34.15
  TC(MIN.) =    6.89

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.89
  RAINFALL INTENSITY(INCH/HR) =   4.61
  TOTAL STREAM AREA(ACRES) =     9.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     34.15

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    214.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    493.40
  DOWNSTREAM ELEVATION(FEET) =    492.50
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.045
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.01
  TOTAL AREA(ACRES) =      0.21   TOTAL RUNOFF(CFS) =      1.01

****************************************************************************
  FLOW PROCESS FROM NODE    214.00 TO NODE    206.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  5 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  492.50  DOWNSTREAM ELEVATION(FEET) =  480.90
```

```
  STREET LENGTH(FEET) =   925.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  18.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       4.19
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.79
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.35
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.71
  STREET FLOW TRAVEL TIME(MIN.) =   6.56   Tc(MIN.) =    9.60
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.718
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.95      SUBAREA RUNOFF(CFS) =    6.16
  TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =       6.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.83
  FLOW VELOCITY(FEET/SEC.) =  2.64   DEPTH*VELOCITY(FT*FT/SEC.) =   0.91
  LONGEST FLOWPATH FROM NODE    212.00 TO NODE    206.00 =     985.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    206.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.60
  RAINFALL INTENSITY(INCH/HR) =   3.72
  TOTAL STREAM AREA(ACRES) =     2.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.83

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       34.46     7.62        4.317         10.42
      2       34.15     6.89        4.607          9.96
      3        6.83     9.60        3.718          2.16

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       70.19     6.89       4.607
      2       71.87     7.62       4.317
      3       64.06     9.60       3.718

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      71.87   Tc(MIN.) =    7.62
  TOTAL AREA(ACRES) =       22.5
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1375.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    213.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   470.00  DOWNSTREAM(FEET) =   430.00
  FLOW LENGTH(FEET) =   900.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.84
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      71.87
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =    8.41
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =    2275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    213.00 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.) =    8.41
  RAINFALL INTENSITY(INCH/HR) =   4.05
  TOTAL STREAM AREA(ACRES) =    22.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     71.87

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    78.00
  UPSTREAM ELEVATION(FEET) =    481.90
  DOWNSTREAM ELEVATION(FEET) =    479.40
  ELEVATION DIFFERENCE(FEET) =      2.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.235
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.00
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      1.00

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  5 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  479.40  DOWNSTREAM ELEVATION(FEET) =  440.30
  STREET LENGTH(FEET) =   760.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 25.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  18.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       5.67
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.18
  STREET FLOW TRAVEL TIME(MIN.) =   2.92   Tc(MIN.) =    6.15
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.955
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  SUBAREA AREA(ACRES) =    2.34      SUBAREA RUNOFF(CFS) =    9.28
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =      10.15
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.50
  FLOW VELOCITY(FEET/SEC.) =  4.98   DEPTH*VELOCITY(FT*FT/SEC.) =   1.57
  LONGEST FLOWPATH FROM NODE    211.00 TO NODE    213.00 =     838.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    213.00 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.) =    6.15
  RAINFALL INTENSITY(INCH/HR) =   4.96
  TOTAL STREAM AREA(ACRES) =     2.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.15

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       71.87     8.41        4.049         22.54
      2       10.15     6.15        4.955          2.56

  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       68.87     6.15       4.955
      2       80.16     8.41       4.049

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      80.16   Tc(MIN.) =    8.41
  TOTAL AREA(ACRES) =       25.1
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =    2275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    215.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   430.00  DOWNSTREAM(FEET) =   429.30
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  31.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.17
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      80.16
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    8.51
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    215.00 =    2340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.51
  RAINFALL INTENSITY(INCH/HR) =   4.02
  TOTAL STREAM AREA(ACRES) =    25.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     80.16

****************************************************************************
  FLOW PROCESS FROM NODE    216.00 TO NODE    218.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .8000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    486.00
  DOWNSTREAM ELEVATION(FEET) =    484.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.712
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.82
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.82

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   473.50  DOWNSTREAM(FEET) =   457.50
  FLOW LENGTH(FEET) =   810.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.58
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.82
  PIPE TRAVEL TIME(MIN.) =   2.95    Tc(MIN.) =    6.66
  LONGEST FLOWPATH FROM NODE    216.00 TO NODE    220.00 =     885.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.707
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .8000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8000
  SUBAREA AREA(ACRES) =    9.84   SUBAREA RUNOFF(CFS) =   37.06
  TOTAL AREA(ACRES) =       10.0   TOTAL RUNOFF(CFS) =      37.73
  TC(MIN.) =    6.66

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    215.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   457.50  DOWNSTREAM(FEET) =   429.30
  FLOW LENGTH(FEET) =   220.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.21
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      37.73
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    6.81
  LONGEST FLOWPATH FROM NODE    216.00 TO NODE    215.00 =    1105.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.81
  RAINFALL INTENSITY(INCH/HR) =   4.64
  TOTAL STREAM AREA(ACRES) =    10.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     37.73

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    224.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    465.80
  DOWNSTREAM ELEVATION(FEET) =    463.20
  ELEVATION DIFFERENCE(FEET) =      2.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.261
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.18
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      1.18

********************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    214.00 IS CODE =  62
--------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  463.20  DOWNSTREAM ELEVATION(FEET) =  440.90
  STREET LENGTH(FEET) =  1020.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       5.68
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.92
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.11
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
  STREET FLOW TRAVEL TIME(MIN.) =   5.47   Tc(MIN.) =    8.73
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.953
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8000
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  SUBAREA AREA(ACRES) =    2.78      SUBAREA RUNOFF(CFS) =    8.79
  TOTAL AREA(ACRES) =        3.0        PEAK FLOW RATE(CFS) =       9.61

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.14
  FLOW VELOCITY(FEET/SEC.) =  3.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.23
  LONGEST FLOWPATH FROM NODE    222.00 TO NODE    214.00 =    1100.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    215.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.73
  RAINFALL INTENSITY(INCH/HR) =   3.95
  TOTAL STREAM AREA(ACRES) =     3.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.61

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       80.16     8.51        4.019         25.10
      2       37.73     6.81        4.640         10.02
      3        9.61     8.73        3.953          3.04
```

```
  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      114.68     6.81       4.640
      2      122.22     8.51       4.019
      3      120.61     8.73       3.953

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     122.22   Tc(MIN.) =    8.51
  TOTAL AREA(ACRES) =       38.2
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    215.00 =    2340.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   429.30  DOWNSTREAM(FEET) =   420.00
  FLOW LENGTH(FEET) =   774.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  35.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.98
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     122.22
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =    9.51
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    226.00 =    3114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 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.) =    9.51
  RAINFALL INTENSITY(INCH/HR) =   3.74
  TOTAL STREAM AREA(ACRES) =    38.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    122.22

****************************************************************************
  FLOW PROCESS FROM NODE    228.00 TO NODE    230.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    451.00
  DOWNSTREAM ELEVATION(FEET) =    449.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.935
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    226.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.00  DOWNSTREAM(FEET) =   420.00
  FLOW LENGTH(FEET) =   790.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.76
 PIPE TRAVEL TIME(MIN.) =   2.78    Tc(MIN.) =    6.72
 LONGEST FLOWPATH FROM NODE    228.00 TO NODE    226.00 =     865.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    230.00 TO NODE    226.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.683
 DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
 SOIL CLASSIFICATION IS "D"
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
 SUBAREA AREA(ACRES) =    9.99   SUBAREA RUNOFF(CFS) =   35.09
 TOTAL AREA(ACRES) =       10.2   TOTAL RUNOFF(CFS) =      35.72
 TC(MIN.) =    6.72

****************************************************************************
 FLOW PROCESS FROM NODE    226.00 TO NODE    226.00 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.) =    6.72
 RAINFALL INTENSITY(INCH/HR) =   4.68
 TOTAL STREAM AREA(ACRES) =    10.17
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.72

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1      122.22     9.51        3.743         38.16
     2       35.72     6.72        4.683         10.17

 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      133.40     6.72       4.683
     2      150.77     9.51       3.743

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     150.77   Tc(MIN.) =    9.51
 TOTAL AREA(ACRES) =       48.3
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    226.00 =    3114.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    226.00 TO NODE    258.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   420.00  DOWNSTREAM(FEET) =   380.00
 FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  41.71
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     150.77
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.58
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    258.00 =    3294.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    258.00 TO NODE    258.00 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.) =    9.58
  RAINFALL INTENSITY(INCH/HR) =   3.72
  TOTAL STREAM AREA(ACRES) =    48.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    150.77

****************************************************************************
  FLOW PROCESS FROM NODE    254.00 TO NODE    256.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7800
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    408.50
  DOWNSTREAM ELEVATION(FEET) =    407.20
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.686
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.80
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.80

****************************************************************************
  FLOW PROCESS FROM NODE    256.00 TO NODE    258.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  407.20  DOWNSTREAM ELEVATION(FEET) =  392.50
  STREET LENGTH(FEET) =  1060.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 38.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       7.96
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.33
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   6.22   Tc(MIN.) =    9.91
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.645
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7800
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.780
  SUBAREA AREA(ACRES) =    4.88      SUBAREA RUNOFF(CFS) =   13.87
  TOTAL AREA(ACRES) =        5.1        PEAK FLOW RATE(CFS) =      14.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  14.42
  FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE    254.00 TO NODE    258.00 =    1125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    259.00 TO NODE    258.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.645
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7800
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7800
```

```
  SUBAREA AREA(ACRES) =    3.22   SUBAREA RUNOFF(CFS) =    9.15
  TOTAL AREA(ACRES) =        8.3   TOTAL RUNOFF(CFS) =      23.54
  TC(MIN.) =    9.91

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    258.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.91
  RAINFALL INTENSITY(INCH/HR) =   3.64
  TOTAL STREAM AREA(ACRES) =     8.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.54

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      150.77     9.58        3.725         48.33
      2       23.54     9.91        3.645          8.28

  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      173.53     9.58       3.725
      2      171.08     9.91       3.645

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     173.53   Tc(MIN.) =    9.58
  TOTAL AREA(ACRES) =       56.6
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    258.00 =    3294.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    258.00 TO NODE    172.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   380.00  DOWNSTREAM(FEET) =   365.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  33.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.77
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     173.53
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   10.02
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    172.00 =    3824.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 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      173.53    10.02       3.617       56.61
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    172.00 =    3824.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      245.65    10.16       3.585       93.34
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    172.00 =    5381.00 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     415.80      10.02        3.617
      2     417.64      10.16        3.585

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     417.64   Tc(MIN.) =   10.16
  TOTAL AREA(ACRES) =      150.0

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    172.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   365.00  DOWNSTREAM(FEET) =   358.00
  FLOW LENGTH(FEET) =   530.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  72.0 INCH PIPE IS  53.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.49
  ESTIMATED PIPE DIAMETER(INCH) =  72.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     417.64
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =   10.64
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    174.00 =    5911.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.64
  RAINFALL INTENSITY(INCH/HR) =   3.48
  TOTAL STREAM AREA(ACRES) =   149.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    417.64

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    178.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    390.00
  DOWNSTREAM ELEVATION(FEET) =    388.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.68

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   377.50  DOWNSTREAM(FEET) =   369.00
  FLOW LENGTH(FEET) =   750.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.57
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       0.68
  PIPE TRAVEL TIME(MIN.) =   3.50    Tc(MIN.) =    7.83
  LONGEST FLOWPATH FROM NODE    176.00 TO NODE    180.00 =     825.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.241
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   15.87   SUBAREA RUNOFF(CFS) =   50.48
  TOTAL AREA(ACRES) =       16.0   TOTAL RUNOFF(CFS) =      50.99
  TC(MIN.) =    7.83

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   369.00  DOWNSTREAM(FEET) =   358.00
  FLOW LENGTH(FEET) =   760.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  21.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.17
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      50.99
  PIPE TRAVEL TIME(MIN.) =   1.04    Tc(MIN.) =    8.87
  LONGEST FLOWPATH FROM NODE    176.00 TO NODE    174.00 =    1585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    174.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.913
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   16.23   SUBAREA RUNOFF(CFS) =   47.64
  TOTAL AREA(ACRES) =       32.3   TOTAL RUNOFF(CFS) =      94.68
  TC(MIN.) =    8.87

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.87
  RAINFALL INTENSITY(INCH/HR) =   3.91
  TOTAL STREAM AREA(ACRES) =    32.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     94.68

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    184.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    405.00
  DOWNSTREAM ELEVATION(FEET) =    387.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.924
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.68

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    186.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   376.00  DOWNSTREAM(FEET) =   369.00
  FLOW LENGTH(FEET) =   800.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.24
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.68
  PIPE TRAVEL TIME(MIN.) =   4.12    Tc(MIN.) =    7.04
  LONGEST FLOWPATH FROM NODE    182.00 TO NODE    186.00 =     900.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    186.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.541
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   13.09   SUBAREA RUNOFF(CFS) =   44.58
  TOTAL AREA(ACRES) =       13.2   TOTAL RUNOFF(CFS) =      45.12
  TC(MIN.) =    7.04

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   369.00  DOWNSTREAM(FEET) =   358.00
  FLOW LENGTH(FEET) =   630.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.64
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.12
  PIPE TRAVEL TIME(MIN.) =   0.83    Tc(MIN.) =    7.88
  LONGEST FLOWPATH FROM NODE    182.00 TO NODE    174.00 =    1530.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    174.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.226
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =   11.60   SUBAREA RUNOFF(CFS) =   36.76
  TOTAL AREA(ACRES) =       24.9   TOTAL RUNOFF(CFS) =      78.76
  TC(MIN.) =    7.88

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.88
  RAINFALL INTENSITY(INCH/HR) =   4.23
```

```
  TOTAL STREAM AREA(ACRES) =    24.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     78.76

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      417.64    10.64        3.480        149.95
      2       94.68     8.87        3.913         32.26
      3       78.76     7.88        4.226         24.85

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      471.87     7.88       4.226
      2      515.76     8.87       3.913
      3      566.69    10.64       3.480

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     566.69   Tc(MIN.) =   10.64
  TOTAL AREA(ACRES) =      207.1
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    174.00 =    5911.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    188.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   358.00  DOWNSTREAM(FEET) =   355.00
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  75.0 INCH PIPE IS  60.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.49
  ESTIMATED PIPE DIAMETER(INCH) =  75.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     566.69
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =   10.78
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    188.00 =    6091.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    188.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.451
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7417
  SUBAREA AREA(ACRES) =    1.22   SUBAREA RUNOFF(CFS) =    1.26
  TOTAL AREA(ACRES) =      208.3   TOTAL RUNOFF(CFS) =     566.69
  TC(MIN.) =   10.78
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    188.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   355.00  DOWNSTREAM(FEET) =   305.00
  FLOW LENGTH(FEET) =   660.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  57.0 INCH PIPE IS  44.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  38.10
  ESTIMATED PIPE DIAMETER(INCH) =  57.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     566.69
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   11.07
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    6751.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  10
```

```
------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    234.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    572.30
  DOWNSTREAM ELEVATION(FEET) =    570.40
  ELEVATION DIFFERENCE(FEET) =      1.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.699
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.67

******************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    236.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  570.40  DOWNSTREAM ELEVATION(FEET) =  502.90
  STREET LENGTH(FEET) =   980.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  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) =       4.12
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.33
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.54
  STREET FLOW TRAVEL TIME(MIN.) =   3.06   Tc(MIN.) =    5.76
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.169
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.56      SUBAREA RUNOFF(CFS) =    6.85
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       7.47

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.55
  FLOW VELOCITY(FEET/SEC.) =  6.07   DEPTH*VELOCITY(FT*FT/SEC.) =   2.05
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    236.00 =    1050.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    236.00 TO NODE    238.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   499.00  DOWNSTREAM(FEET) =   454.00
  FLOW LENGTH(FEET) =   930.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.22
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       7.47
  PIPE TRAVEL TIME(MIN.) =   1.38    Tc(MIN.) =    7.14
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    238.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    238.00 TO NODE    238.00 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.) =    7.14
  RAINFALL INTENSITY(INCH/HR) =   4.50
  TOTAL STREAM AREA(ACRES) =     1.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.47

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    242.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    503.90
  DOWNSTREAM ELEVATION(FEET) =    502.60
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.880
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.16
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      1.16

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    238.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  502.60  DOWNSTREAM ELEVATION(FEET) =  467.20
  STREET LENGTH(FEET) =  1020.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  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) =       5.24
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.48
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.31
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.45
  STREET FLOW TRAVEL TIME(MIN.) =   3.95   Tc(MIN.) =    6.83
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.635
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    2.05      SUBAREA RUNOFF(CFS) =    8.08
  TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.02

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.15
  FLOW VELOCITY(FEET/SEC.) =  4.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.90
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    238.00 =    1085.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    238.00 TO NODE    238.00 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.) =    6.83
  RAINFALL INTENSITY(INCH/HR) =   4.63
  TOTAL STREAM AREA(ACRES) =     2.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.02

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.47     7.14        4.500          1.70
      2        9.02     6.83        4.635          2.29

  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       16.16     6.83       4.635
      2       16.23     7.14       4.500

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.23   Tc(MIN.) =    7.14
  TOTAL AREA(ACRES) =        4.0
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    238.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    238.00 TO NODE    240.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   464.00  DOWNSTREAM(FEET) =   392.50
  FLOW LENGTH(FEET) =   990.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.88
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.23
  PIPE TRAVEL TIME(MIN.) =   1.04    Tc(MIN.) =    8.18
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    240.00 =    2970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 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.) =    8.18
  RAINFALL INTENSITY(INCH/HR) =   4.12
  TOTAL STREAM AREA(ACRES) =     3.99
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.23

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    244.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .6900
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    476.50
  DOWNSTREAM ELEVATION(FEET) =    474.10
```

```
  ELEVATION DIFFERENCE(FEET) =      2.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.337
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.70
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.70

****************************************************************************
  FLOW PROCESS FROM NODE    244.00 TO NODE    240.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  474.10  DOWNSTREAM ELEVATION(FEET) =  406.50
  STREET LENGTH(FEET) =  1250.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  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) =       8.06
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   11.46
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.62
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.00
  STREET FLOW TRAVEL TIME(MIN.) =   3.70   Tc(MIN.) =    8.04
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.169
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .6900
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  SUBAREA AREA(ACRES) =    5.02      SUBAREA RUNOFF(CFS) =   14.44
  TOTAL AREA(ACRES) =        5.2        PEAK FLOW RATE(CFS) =      14.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.77
  FLOW VELOCITY(FEET/SEC.) =  6.51   DEPTH*VELOCITY(FT*FT/SEC.) =   2.74
  LONGEST FLOWPATH FROM NODE    242.00 TO NODE    240.00 =    1325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 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.) =    8.04
  RAINFALL INTENSITY(INCH/HR) =   4.17
  TOTAL STREAM AREA(ACRES) =     5.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.96

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       16.23     8.18        4.123          3.99
      2       14.96     8.04        4.169          5.20

  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       31.01     8.04       4.169
```

```
      2       31.02     8.18       4.123

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      31.02   Tc(MIN.) =    8.18
  TOTAL AREA(ACRES) =        9.2
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    240.00 =    2970.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    242.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   392.50  DOWNSTREAM(FEET) =   391.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.80
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      31.02
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    8.37
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    242.00 =    3070.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    242.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.37
  RAINFALL INTENSITY(INCH/HR) =   4.06
  TOTAL STREAM AREA(ACRES) =     9.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.02

****************************************************************************
  FLOW PROCESS FROM NODE    248.00 TO NODE    250.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    470.00
  DOWNSTREAM ELEVATION(FEET) =    468.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.330
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE    250.00 TO NODE    252.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   457.00  DOWNSTREAM(FEET) =   442.00
  FLOW LENGTH(FEET) =   740.00   MANNING'S N =  0.012
  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.) =   4.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.76
  PIPE TRAVEL TIME(MIN.) =   2.73    Tc(MIN.) =    7.06
  LONGEST FLOWPATH FROM NODE    248.00 TO NODE    252.00 =     815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    250.00 TO NODE    252.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.535
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    8.11   SUBAREA RUNOFF(CFS) =   27.58
  TOTAL AREA(ACRES) =        8.3   TOTAL RUNOFF(CFS) =      28.20
  TC(MIN.) =    7.06

****************************************************************************
  FLOW PROCESS FROM NODE    252.00 TO NODE    242.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   442.00  DOWNSTREAM(FEET) =   391.50
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  26.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.20
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    7.22
  LONGEST FLOWPATH FROM NODE    248.00 TO NODE    242.00 =    1075.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    242.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.22
  RAINFALL INTENSITY(INCH/HR) =   4.47
  TOTAL STREAM AREA(ACRES) =     8.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.20

****************************************************************************
  FLOW PROCESS FROM NODE    244.00 TO NODE    246.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7900
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    413.00
  DOWNSTREAM ELEVATION(FEET) =    412.10
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.776
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.81
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.81

****************************************************************************
  FLOW PROCESS FROM NODE    246.00 TO NODE    242.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  412.10  DOWNSTREAM ELEVATION(FEET) =  407.00
  STREET LENGTH(FEET) =   550.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 38.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       9.22
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   13.07
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.52
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.98
  STREET FLOW TRAVEL TIME(MIN.) =   3.63   Tc(MIN.) =    7.41
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.396
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7900
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.790
  SUBAREA AREA(ACRES) =    4.77      SUBAREA RUNOFF(CFS) =   16.57
  TOTAL AREA(ACRES) =        4.9        PEAK FLOW RATE(CFS) =      17.19

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  16.81
  FLOW VELOCITY(FEET/SEC.) =  2.92   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE    244.00 TO NODE    242.00 =     610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    242.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.41
  RAINFALL INTENSITY(INCH/HR) =   4.40
  TOTAL STREAM AREA(ACRES) =     4.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.19

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       31.02     8.37        4.062          9.19
      2       28.20     7.22        4.468          8.29
      3       17.19     7.41        4.396          4.95

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       73.16     7.22       4.468
      2       73.60     7.41       4.396
      3       72.54     8.37       4.062

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      73.60   Tc(MIN.) =    7.41
  TOTAL AREA(ACRES) =       22.4
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    242.00 =    3070.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   391.50  DOWNSTREAM(FEET) =   305.00
  FLOW LENGTH(FEET) =  1620.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.43
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      73.60
  PIPE TRAVEL TIME(MIN.) =   1.32    Tc(MIN.) =    8.73
  LONGEST FLOWPATH FROM NODE    232.00 TO NODE    190.00 =    4690.00 FEET.

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

```
 FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 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       73.60     8.73       3.955       22.43
 LONGEST FLOWPATH FROM NODE    232.00 TO NODE    190.00 =    4690.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1      566.69    11.07       3.392      208.28
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    190.00 =    6751.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1     520.38       8.73        3.955
    2     629.83      11.07        3.392

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     629.83   Tc(MIN.) =   11.07
 TOTAL AREA(ACRES) =      230.7

********************************************************************************
 FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  12
--------------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
================================================================================

********************************************************************************
 FLOW PROCESS FROM NODE    190.00 TO NODE    192.00 IS CODE =  31
--------------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   305.00  DOWNSTREAM(FEET) =   218.00
 FLOW LENGTH(FEET) =  1200.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  60.0 INCH PIPE IS  46.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  38.55
 ESTIMATED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     629.83
 PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   11.59
 LONGEST FLOWPATH FROM NODE    101.00 TO NODE    192.00 =    7951.00 FEET.

********************************************************************************
 FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
--------------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.59
 RAINFALL INTENSITY(INCH/HR) =   3.29
 TOTAL STREAM AREA(ACRES) =   230.71
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    629.83

********************************************************************************
 FLOW PROCESS FROM NODE    194.00 TO NODE    196.00 IS CODE =  21
--------------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
 PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
 SOIL CLASSIFICATION IS "D"
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
 UPSTREAM ELEVATION(FEET) =    338.00
 DOWNSTREAM ELEVATION(FEET) =    336.00
 ELEVATION DIFFERENCE(FEET) =      2.00
```

```
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.490
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.747
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.34   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    192.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   324.00  DOWNSTREAM(FEET) =   218.00
  FLOW LENGTH(FEET) =  1415.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.79
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.38
  PIPE TRAVEL TIME(MIN.) =   4.07    Tc(MIN.) =   13.56
  LONGEST FLOWPATH FROM NODE    194.00 TO NODE    192.00 =    1495.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.976
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =   25.38   SUBAREA RUNOFF(CFS) =   22.66
  TOTAL AREA(ACRES) =       25.7   TOTAL RUNOFF(CFS) =      22.97
  TC(MIN.) =   13.56

****************************************************************************
  FLOW PROCESS FROM NODE    193.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.976
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3151
  SUBAREA AREA(ACRES) =    1.36   SUBAREA RUNOFF(CFS) =    2.43
  TOTAL AREA(ACRES) =       27.1   TOTAL RUNOFF(CFS) =      25.39
  TC(MIN.) =   13.56

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.976
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .2000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3068
  SUBAREA AREA(ACRES) =    2.09   SUBAREA RUNOFF(CFS) =    1.24
  TOTAL AREA(ACRES) =       29.2   TOTAL RUNOFF(CFS) =      26.64
  TC(MIN.) =   13.56

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.56
  RAINFALL INTENSITY(INCH/HR) =   2.98
  TOTAL STREAM AREA(ACRES) =    29.17
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     26.64

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      629.83    11.59        3.294        230.71
      2       26.64    13.56        2.976         29.17

  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      652.59    11.59       3.294
      2      595.78    13.56       2.976

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     652.59   Tc(MIN.) =   11.59
  TOTAL AREA(ACRES) =      259.9
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    192.00 =    7951.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   215.00  DOWNSTREAM(FEET) =   205.00
  FLOW LENGTH(FEET) =   247.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  69.0 INCH PIPE IS  51.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  31.47
  ESTIMATED PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     652.59
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   11.72
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    198.00 =    8198.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.270
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6943
  SUBAREA AREA(ACRES) =    1.08   SUBAREA RUNOFF(CFS) =    2.12
  TOTAL AREA(ACRES) =      261.0   TOTAL RUNOFF(CFS) =     652.59
  TC(MIN.) =   11.72
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.72
  RAINFALL INTENSITY(INCH/HR) =   3.27
  TOTAL STREAM AREA(ACRES) =   260.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    652.59

****************************************************************************
  FLOW PROCESS FROM NODE    512.00 TO NODE    514.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
```

```
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    320.00
  ELEVATION DIFFERENCE(FEET) =     50.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.99
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      0.99

****************************************************************************
  FLOW PROCESS FROM NODE    514.00 TO NODE    516.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    320.00  DOWNSTREAM(FEET) =    238.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.1093
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.065
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.76
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.06
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   1.77
  Tc(MIN.) =    5.95
  SUBAREA AREA(ACRES) =    26.24       SUBAREA RUNOFF(CFS) =   66.45
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.501
  TOTAL AREA(ACRES) =       26.5         PEAK FLOW RATE(CFS) =      67.33

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =   8.65
  LONGEST FLOWPATH FROM NODE    512.00 TO NODE    516.00 =     850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    513.00 TO NODE    516.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.065
  NORMAL RESIDENTIAL (R1) RUNOFF COEFFICIENT = .6500
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5060
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    2.96
  TOTAL AREA(ACRES) =       27.4   TOTAL RUNOFF(CFS) =      70.30
  TC(MIN.) =    5.95

****************************************************************************
  FLOW PROCESS FROM NODE    516.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   228.00  DOWNSTREAM(FEET) =   205.00
  FLOW LENGTH(FEET) =  1000.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.54
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      70.30
  PIPE TRAVEL TIME(MIN.) =   1.15    Tc(MIN.) =    7.09
  LONGEST FLOWPATH FROM NODE    512.00 TO NODE    198.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 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.) =    7.09
  RAINFALL INTENSITY(INCH/HR) =   4.52
  TOTAL STREAM AREA(ACRES) =    27.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     70.30

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      652.59    11.72        3.270        260.96
      2       70.30     7.09        4.521         27.43

  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      542.32     7.09       4.521
      2      703.44    11.72       3.270

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     703.44   Tc(MIN.) =   11.72
  TOTAL AREA(ACRES) =      288.4
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    198.00 =    8198.00 FEET.

+----------------------------------------------------------------------------+
| MAIN STREET RUNOFF TO VILLAGE 8 WEST                                       |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    559.60
  DOWNSTREAM ELEVATION(FEET) =    557.00
  ELEVATION DIFFERENCE(FEET) =      2.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.717
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.06
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      1.06

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    304.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  557.00  DOWNSTREAM ELEVATION(FEET) =  528.00
  STREET LENGTH(FEET) =   900.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 42.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  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) =       8.74
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.87
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   3.75   Tc(MIN.) =    6.47
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.799
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    3.73      SUBAREA RUNOFF(CFS) =   15.22
  TOTAL AREA(ACRES) =        4.0        PEAK FLOW RATE(CFS) =      16.11

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.75
  FLOW VELOCITY(FEET/SEC.) =  4.62   DEPTH*VELOCITY(FT*FT/SEC.) =   1.76
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   519.36  DOWNSTREAM(FEET) =   512.54
  FLOW LENGTH(FEET) =   113.26   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.73
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.11
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    6.59
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    305.00 =    1093.26 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    305.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.739
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8007
  SUBAREA AREA(ACRES) =    3.84   SUBAREA RUNOFF(CFS) =   13.65
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      29.56
  TC(MIN.) =    6.59

+--------------------------------------------------------------------------+
| AREA TRIBUTARY TO BIOFILTRATION BASIN                                    |
| AREA FROM BASIN COMMINGLES WITH VILLAGE 8 WEST                           |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    238.00
  DOWNSTREAM ELEVATION(FEET) =    236.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.490
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.747
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    404.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   224.00  DOWNSTREAM(FEET) =   205.20
  FLOW LENGTH(FEET) =   940.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.00
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.19
  PIPE TRAVEL TIME(MIN.) =   5.23    Tc(MIN.) =   14.72
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =    1020.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.823
  PARKS, GOLF COURSES RUNOFF COEFFICIENT = .3000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =   13.56   SUBAREA RUNOFF(CFS) =   11.48
  TOTAL AREA(ACRES) =       13.7   TOTAL RUNOFF(CFS) =      11.63
  TC(MIN.) =   14.72

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.823
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (FLAT) RUNOFF COEFFICIENT = .2000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.2989
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.08
  TOTAL AREA(ACRES) =       13.9   TOTAL RUNOFF(CFS) =      11.71
  TC(MIN.) =   14.72

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   209.00  DOWNSTREAM(FEET) =   206.00
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.71
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.75
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =    1050.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    504.00 TO NODE    506.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    340.00
  DOWNSTREAM ELEVATION(FEET) =    300.00
  ELEVATION DIFFERENCE(FEET) =     40.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.013
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
```

```
  50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.655
 SUBAREA RUNOFF(CFS) =      0.82
 TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      0.82

****************************************************************************
 FLOW PROCESS FROM NODE    506.00 TO NODE    508.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    300.00  DOWNSTREAM(FEET) =    240.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   830.00   CHANNEL SLOPE =  0.0723
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
  50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.189
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.88
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.66
 AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   2.97
 Tc(MIN.) =    7.98
 SUBAREA AREA(ACRES) =    13.13       SUBAREA RUNOFF(CFS) =   27.50
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
 TOTAL AREA(ACRES) =       13.4         PEAK FLOW RATE(CFS) =      28.11

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   5.71
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    508.00 =     930.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    508.00 TO NODE    513.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   220.00  DOWNSTREAM(FEET) =   212.00
 FLOW LENGTH(FEET) =   500.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.27
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.11
 PIPE TRAVEL TIME(MIN.) =   0.81    Tc(MIN.) =    8.79
 LONGEST FLOWPATH FROM NODE    504.00 TO NODE    513.00 =    1430.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    513.00 TO NODE    513.00 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.) =    8.79
 RAINFALL INTENSITY(INCH/HR) =   3.94
 TOTAL STREAM AREA(ACRES) =    13.42
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.11

****************************************************************************
 FLOW PROCESS FROM NODE    509.00 TO NODE    511.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    325.00
 DOWNSTREAM ELEVATION(FEET) =    318.00
 ELEVATION DIFFERENCE(FEET) =      7.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.646
  50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.238
 SUBAREA RUNOFF(CFS) =      0.79
 TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.79
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    511.00 TO NODE    513.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    318.00  DOWNSTREAM(FEET) =    222.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   930.00   CHANNEL SLOPE =  0.1032
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.006
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.77
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.33
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   2.91
  Tc(MIN.) =    8.55
  SUBAREA AREA(ACRES) =    13.77       SUBAREA RUNOFF(CFS) =   27.58
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =       14.1         PEAK FLOW RATE(CFS) =      28.18

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOW VELOCITY(FEET/SEC.) =   6.54
  LONGEST FLOWPATH FROM NODE    509.00 TO NODE    513.00 =    1030.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    513.00 TO NODE    513.00 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.) =    8.55
  RAINFALL INTENSITY(INCH/HR) =   4.01
  TOTAL STREAM AREA(ACRES) =    14.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.18

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       28.11     8.79        3.935         13.42
      2       28.18     8.55        4.006         14.07

  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       55.52     8.55       4.006
      2       55.79     8.79       3.935

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      55.79   Tc(MIN.) =    8.79
  TOTAL AREA(ACRES) =       27.5
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    513.00 =    1430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    513.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   212.00  DOWNSTREAM(FEET) =   207.00
  FLOW LENGTH(FEET) =   834.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.29
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      55.79
```

```
  PIPE TRAVEL TIME(MIN.) =   1.68    Tc(MIN.) =   10.47
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    405.00 =    2264.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 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       55.79    10.47       3.517       27.49
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    405.00 =    2264.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       11.71    14.75       2.819       13.88
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =    1050.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      64.11      10.47        3.517
      2      56.44      14.75        2.819

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      64.11   Tc(MIN.) =   10.47
  TOTAL AREA(ACRES) =       41.4

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   206.00  DOWNSTREAM(FEET) =   180.00
  FLOW LENGTH(FEET) =   740.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.76
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      64.11
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =   11.21
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    406.00 =    3004.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.21
  RAINFALL INTENSITY(INCH/HR) =   3.37
  TOTAL STREAM AREA(ACRES) =    41.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     64.11

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  21.52   RAIN INTENSITY(INCH/HOUR) =  2.21
```

```
  TOTAL AREA(ACRES) =   181.20   TOTAL RUNOFF(CFS) =    306.14

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 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.) =   21.52
  RAINFALL INTENSITY(INCH/HR) =   2.21
  TOTAL STREAM AREA(ACRES) =   181.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    306.14

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       64.11    11.21        3.366         41.37
      2      306.14    21.52        2.210        181.20

  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      223.53    11.21       3.366
      2      348.22    21.52       2.210

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     348.22   Tc(MIN.) =   21.52
  TOTAL AREA(ACRES) =      222.6
  LONGEST FLOWPATH FROM NODE    504.00 TO NODE    406.00 =    3004.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    408.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.210
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7022
  SUBAREA AREA(ACRES) =    1.38   SUBAREA RUNOFF(CFS) =    1.83
  TOTAL AREA(ACRES) =      224.0   TOTAL RUNOFF(CFS) =     348.22
  TC(MIN.) =   21.52
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    518.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.210
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7020
  SUBAREA AREA(ACRES) =    0.54   SUBAREA RUNOFF(CFS) =    0.72
  TOTAL AREA(ACRES) =      224.5   TOTAL RUNOFF(CFS) =     348.23
  TC(MIN.) =   21.52

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.210
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7006
```

```
  SUBAREA AREA(ACRES) =    1.58   SUBAREA RUNOFF(CFS) =    1.75
  TOTAL AREA(ACRES) =      226.1   TOTAL RUNOFF(CFS) =     349.97
  TC(MIN.) =   21.52

****************************************************************************
  FLOW PROCESS FROM NODE    511.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.210
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6968
  SUBAREA AREA(ACRES) =    4.35   SUBAREA RUNOFF(CFS) =    4.81
  TOTAL AREA(ACRES) =      230.4   TOTAL RUNOFF(CFS) =     354.78
  TC(MIN.) =   21.52

+--------------------------------------------------------------------------+
| SLOPE RUNOFF TO SR125                                                    |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    600.00
  DOWNSTREAM ELEVATION(FEET) =    590.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.22
  TOTAL AREA(ACRES) =      0.36   TOTAL RUNOFF(CFS) =      1.22

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    590.00  DOWNSTREAM(FEET) =    375.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  3530.00   CHANNEL SLOPE =  0.0609
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.371
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.89
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =  15.11
  Tc(MIN.) =   19.29
  SUBAREA AREA(ACRES) =    12.33       SUBAREA RUNOFF(CFS) =   14.62
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.503
  TOTAL AREA(ACRES) =       12.7         PEAK FLOW RATE(CFS) =      15.13

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   4.42
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    3630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   375.00  DOWNSTREAM(FEET) =   335.00
  FLOW LENGTH(FEET) =   874.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.09
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.13
  PIPE TRAVEL TIME(MIN.) =   1.11    Tc(MIN.) =   20.40
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    503.00 =    4504.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    503.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.287
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5021
  SUBAREA AREA(ACRES) =    4.81   SUBAREA RUNOFF(CFS) =    5.50
  TOTAL AREA(ACRES) =       17.5   TOTAL RUNOFF(CFS) =      20.10
  TC(MIN.) =   20.40

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  SOIL CLASSIFICATION IS "D"
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    374.00
  DOWNSTREAM ELEVATION(FEET) =    340.00
  ELEVATION DIFFERENCE(FEET) =     34.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.665
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.61

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    340.00  DOWNSTREAM(FEET) =    305.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.0583
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.030
  VEGETATED SLOPES (ROLLING) RUNOFF COEFFICIENT = .5000
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   4.30
  Tc(MIN.) =    8.48
  SUBAREA AREA(ACRES) =     1.56       SUBAREA RUNOFF(CFS) =    3.14
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.510
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       3.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.68
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     700.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.7  TC(MIN.) =      8.48
  PEAK FLOW RATE(CFS)   =       3.58
==============================================================================
==============================================================================
```

CHAPTER 4

EXHIBIT 1
PRE-DEVELOPED CONDITION
HYDROLOGY MAP

EXHIBIT 2
DEVELOPED CONDITION
HYDROLOGY MAP

EXHIBIT 3
OVERLAY OF FLOOD INSURANCE RATE MAP

EXHIBIT 4
HYDROLOGIC SOIL TYPE LIMITS

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- XX.XX ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- XXX — NODE NUMBER
- EXISTING STORM DRAIN

200 0 200 400 600

SCALE 1"= 200'

NOTES: EXISTING CONTOUR INTERVAL IS 5'

OLYMPIAN HIGH SCHOOL

RUNOFF TO EXIST. STORM DRAIN:
Q_{100} = 10.55 CFS
A = 6.1 AC
Tc = 12.02 MIN

NORTH WATERSHED
Q_{100} = 28.62 CFS
A = 13.72 AC
Tc = 13.47 MIN

NORTHWEST WATERSHED:
RUNOFF TO EXIST. STORM DRAIN
Q_{100} = 21.75 CFS
A = 10.11 AC
Tc = 9.84 MIN

WEST WATERSHED:
RUNOFF TO EXIST. BROW DITCH
Q_{100} = 27.18 CFS
A = 14.26 AC
Tc = 10.60 MIN

NORTHEAST WATERSHED:
EXISTING RUNOFF
Q_{100} = 75.59 CFS
A = 51.54 AC
Tc = 16.65 MIN

SOUTHEAST WATERSHED:
EXISTING RUNOFF
AT OTAY RIVER
Q_{100} = 25.93 CFS
A = 13.28 AC
Tc = 10.22 MIN

EAST WATERSHED:
EXISTING RUNOFF
AT OTAY RIVER
Q_{100} = 45.72 CFS
A = 19.96 AC
Tc = 7.99 MIN

SOUTHWEST WATERSHED :
EXISTING RUNOFF
AT OTAY RIVER
Q_{100} = 380.71 CFS
A = 208.76 AC
Tc = 21.39 MIN

SOUTH WATERSHED:
EXISTING RUNOFF
AT OTAY RIVER
Q_{100} = 50.66 CFS
A = 25.94 AC
Tc = 10.21 MIN

EAST-CENTRAL WATERSHED:
EXISTING RUNOFF
AT OTAY RIVER
Q_{100} = 211.11 CFS
A = 180.32 AC
Tc = 22.58 MIN

OTAY RANCH VILLAGE 8, WEST

OTAY RANCH VILLAGE 9

Magdalena Avenue
MAIN ST. WEST
MAIN ST.
MAIN ST. EAST
LA MEDIA PKWY SOUTH
LA MEDIA PKWY NORTH
LA MEDIA PKWY
AVENIDA CAPRISE
CALLE ESCUELA
SR125
MSCP
FLOODPLAIN
FLOODWAY
OTAY RIVER VALLEY
OTAY RIVER X- SECTION LOCATION FOR HEC-RAS ANALYSIS

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EXISTING HYDROLOGY MAP

OTAY RANCH VILLAGE 8 EAST

CITY OF CHULA VISTA, CALIFORNIA

MAP 1 OF 2

W.O.# 2395-0039

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- XX.XX ACRES — AREA
- X — HYDROLOGIC SOIL TYPE
- XXX — NODE NUMBER
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- WATER QUALITY/SEDIMENT BASIN PER PLAN
- EASEMENT PER PLAN
- PROPOSED CENTERLINE AND CURB LINE
- BROWDITCH OR EARTHEN SWALE PER PLAN

200 0 200 400 600

SCALE 1"= 200'

NOTES: EXISTING CONTOUR INTERVAL IS 5'

ANALYSIS OF CONFLUENCE NODES:

106:
Q100IN= 13.15 CFS (ST) & 24.62 CFS (VC-1)
Q100OUT = 35.29 CFS

110:
Q100IN= 35.29 CFS (SD) & 8.43 CFS (ST)
Q100OUT = 40.14 CFS

122:
Q100IN= 39.02 CFS (VC-2), 39.53 (VC-3), & 8.67 CFS (ST)
Q100OUT = 85.13 CFS

124:
Q100IN= 40.14 CFS (SD) & 85.13 CFS (SD)
Q100OUT = 109.70 CFS

127:
Q100IN= 109.70 CFS (SD) & 36.95 CFS (VC-4 & 5)
Q100OUT = 143.54 CFS

132:
Q100IN= 143.54 CFS (SD) & 8.69 CFS (ST)
Q100OUT = 150.27 CFS

142:
Q100IN= 19.67 CFS (VC-6), 6.35 (ST), & 19.61 CFS (VC-7)
Q100OUT = 41.19 CFS

154-A:
Q100IN=41.19 CFS (SD) & 6.60 CFS (P-1)
Q100OUT = 45.48 CFS

154-B
Q100IN=150.27 CFS (SD) & 45.48 CFS (SD)
Q100OUT = 194.98 CFS

158:
Q100IN= 194.98 CFS (SD) & 16.85 CFS (ST)
Q100OUT = 208.30 CFS

160:
Q100IN= 208.30 CFS (SD), 34.15 (R-4), & 32.02 CFS (R-5)
Q100OUT = 265.13 CFS

172-A:
Q100IN= 265.13 CFS (SD) & 6.71 CFS (ST)
Q100OUT = 270.57 CFS

206:
Q100IN= 37.90 CFS (R-1), 37.55 (R-2), & 7.55 CFS (ST)
Q100OUT = 79.17 CFS

213:
Q100IN= 79.17 CFS (SD) & 11.19 CFS (ST)
Q100OUT = 88.31 CFS

215:
Q100IN= 88.31 CFS (SD), 41.52 (S-1), & 10.59 CFS (ST)
Q100OUT = 134.64 CFS

226:
Q100IN= 134.64 CFS (SD) & 39.25 CFS (R-3)
Q100OUT = 166.15 CFS

258:
Q100IN= 166.15 CFS (SD) & 25.90 CFS (ST)
Q100OUT = 191.08 CFS

172-B:
Q100IN= 270.57 CFS (SD) & 191.08 CFS (SD)
Q100OUT = 459.65 CFS

174:
Q100IN= 459.65 CFS (SD), 104.28 (R-7 & 9), & 87.18 CFS (R-8 &10)
Q100OUT = 623.83 CFS

238:
Q100IN= 8.22 CFS (SD) & 9.95 CFS (ST)
Q100OUT = 17.89 CFS

240:
Q100IN= 17.89 CFS (SD) & 16.48 CFS (ST)
Q100OUT = 34.21 CFS

242:
Q100IN= 34.21 CFS (SD), 31.04 (R-6), & 18.92 CFS (ST)
Q100OUT = 81.15 CFS

190:
Q100IN= 623.83 CFS (SD) & 81.15 CFS (SD)
Q100OUT =693.49 CFS

192:
Q100IN= 693.49 CFS (SD), 29.31 (P-2B)
Q100OUT = 718.46 CFS

198:
Q100IN= 718.46 CFS (SD), 77.34 (BYPASS)
Q100OUT = 774.35 CFS

OLYMPIAN HIGH SCHOOL

VILLAGE 9

LOT A

LOT B

LOT 25

LOT 16

LOT 17

LOT 30

LOT D

LOT 19

LOT 22

Magdalena Avenue

MAIN ST. WEST

MAIN ST. EAST

MAIN ST

LA MEDIA PKWY SOUTH

LA MEDIA PKWY NORTH

LA MEDIA PKWY

SAVORIA PKWY

CALLE ESCUELA

AVENIDA CAPRISE

DEL SUENO DR.

LA PALMITA DR

VIA PALERMO

SANTA LUNA STREET

PASEO ARCHER

CALLE GRANDON

SR-125

MSCP

NORTH WATERSHED
Q_{100} = 32.35 CFS
A = 7.79 AC
Tc = 6.58 MIN

SOUTHWEST WATERSHED : AT OTAY RIVER
Q_{100} = 400.61 CFS
A = 230.42 AC
Tc = 21.39 MIN

SOUTHEAST WATERSHED: AT OTAY RIVER
Q_{100} = 3.94 CFS
A = 1.74 AC
Tc = 8.37 MIN

NORTHEAST WATERSHED:
Q_{100} = 22.13 CFS
A = 17.50 AC
Tc = 20.16 MIN

EAST WATERSHED: PROPOSED RUNOFF AT OTAY RIVER
Q_{100} =774.35 CFS
A = 288.39 AC
Tc = 11.57 MIN

OTAY RIVER X- SECTION LOCATION FOR HEC-RAS ANALYSIS

OTAY RIVER X- SECTION LOCATION FOR HEC-RAS ANALYSIS

FLOODPLAIN

FLOODWAY

FLOODWAY

FLOODPLAIN

MSCP

MSCP

MSCP

VC-1 VC-2 VC-3A VC-3B VC-4 VC-5 VC-6 VC-7

R-1 MH R-2 MH R-3 MH R-4 MH R-5 MH R-6 MH R-7 MH R-8 MH R-9 MH R-10 MH

P-1 P-2 COMMUNITY PARK OS-4 OS-5 OS-7 OSP-1 OSP-2 OSP-3 OSP-4

CPF-1

N.A.P. (UNDERLYING DESIGNATION)

AR-11

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PROPOSED HYDROLOGY MAP

OTAY RANCH VILLAGE 8 EAST

CITY OF CHULA VISTA, CALIFORNIA

MAP 2 OF 2

W.O.# 2395-0039

OLYMPIAN HIGH SCHOOL

LOT 25

LOT 16

LOT 17

LOT 30
PAD AREA: 9.92 AC

LOT D

LOT 19

LOT 22

VILLAG

VC-1
LOT AREA: 7.6 AC
PAD AREA: 7.4 AC

OT A
LOT AREA: 1.0 AC

OS-8
LOT AREA: 2.9 AC

OS-7
LOT AREA: 2.1 AC

R-1
MH
LOT AREA: 9.4 AC
PAD AREA: 8.9 AC

R-2
MH
LOT AREA: 9.4 AC
PAD AREA: 9.2 AC

VC-2
LOT AREA: 9.8 AC
PAD AREA: 9.7 AC

VC-3
LOT AREA: 8.8 AC
PAD AREA: 8.7 AC

CPF-1
LOT AREA: 0.8 AC

P-1
LOT AREA: 7.3 AC
PAD AREA: 7.3 AC

S-1
LOT AREA: 11.3 AC
PAD AREA: 10.0 AC

VC-4
LOT AREA: 4.5 AC
PAD AREA: 4.3 AC

VC-5
LOT AREA: 5.7 AC
PAD AREA: 5.5 AC

VC-7
LOT AREA: 6.0 AC
PAD AREA: 5.5 AC

VC-6
LOT AREA: 4.3 AC
PAD AREA: 4.7 AC

R-4
MH
LOT AREA: 9.0 AC
PAD AREA: 8.9 AC

R-5
MH
LOT AREA: 8.7 AC
PAD AREA: 8.7 AC

R-6
MH
LOT AREA: 8.3 AC
PAD AREA: 8.2 AC

R-3
MH
LOT AREA: 9.8 AC
PAD AREA: 9.8 AC

OS-9
LOT AREA: 3.5 AC

OS-10
LOT AREA: 4.3 AC

OS-11
LOT AREA: 0.4 AC

OS-12
LOT AREA: 1.7 AC

R-7
MH
LOT AREA: 15.4 AC
PAD AREA: 14.9 AC

R-8
MH
LOT AREA: 12.3 AC
PAD AREA: 11.7 AC

R-9
MH
LOT AREA: 15.3 AC
PAD AREA: 15.3 AC

R-10
MH
LOT AREA: 11.5 AC
PAD AREA: 11.5 AC

CPF-2
LOT AREA: 1.2 AC
PAD AREA: 1.2 AC

LOT B
LOT AREA: 8.4 AC

OS-13
LOT AREA: 4.3 AC

OS-13
LOT AREA: 8.3 AC

OS-4
MSCP PRESERVE OS
LOT AREA: 8.4 AC

OS-1
MSCP PRESERVE OS
LOT AREA: 45.6 AC

OS-2
SCP PRESERVE OS
OT AREA: 127.5 AC

OS-1
MSCP PRESERVE OS
LOT AREA: 45.6 AC

OS-5
LOT AREA: 3.4 AC

P-2A
COMMUNITY PARK
LOT AREA: 15.2 AC
PAD AREA: 13.3 AC

P-2B
COMMUNITY PARK
LOT AREA: 28.1 AC
PAD AREA: 25.0 AC

OS-6
LOT AREA: 4.8 AC

OS-2
MSCP PRESERVE OS
LOT AREA: 127.5 AC

OS-3
MSCP PRESERVE OS
LOT AREA: 127.5 AC

OTAY RIVER VALLEY

OTAY RIVER VALLEY

N.A.P.
(UNDERLYING DESIGNATION)

AR-11

ZONE X

ZONE AE

ZONE

MAIN STREET WEST

MAIN STREET EAST

CALLE ESCUELA

LA VISTA PKWY

PASEO ARCHER

CALLE MATISSE

CALLE GRANDON

JASMIN DRIVE

WILEY ROAD

PRIVATE ROAD

SR-125

Otay River

H&A

250 0 250 500 750

SCALE 1"=250'

NOTE: FLOOD PLAIN ELEVATIONS ADJUSTED FROM NGVD29 TO NAVD28 (+2.1')

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EXHIBIT 1.3
OVERLAY OF FLOOD INSURANCE MAP
NOS. 06073C2177, 06073C2178, & 06073C2179

OTAY RANCH VILLAGE 8 EAST

CITY OF CHULA VISTA, CALIFORNIA

SHEET 1 OF 1

W.O.# 2825-0003

R:\0920\Hyd\TM\DR\ACAD\0920$H01-HYDRO Exhibit 1.3 FEMA -V8 TM.dwg[]Jul-03-2023:09:49

LEGEND

PROJECT BOUNDARY

DRAINAGE BOUNDARY

XX.XX ACRES — AREA

X — HYDROLOGIC SOIL TYPE

SOIL TYPE BOUNDARY

200 0 200 400 600

SCALE 1" = 200'

OLYMPIAN HIGH SCHOOL

VILLAGE 9

Magdalena Avenue

MAIN ST. WEST

MAIN ST. EAST

MAIN ST

LA MEDIA PKWY SOUTH

LA MEDIA PKWY NORTH

LA MEDIA PKWY

AVENIDA CAPRISE

SANTA MARISOL

CALLE ESCUELA

OTAY VALLEY RD

ST. A

ST. D

ST. E

ST. F

ST. G

LOT 16

LOT 17

LOT 19

LOT 22

LOT 25

LOT 30

LOT D

LOT A

LOT B

VC-1

VC-2

VC-3

VC-4

VC-5

VC-6

VC-7

OS-7

OS-8

OS-9

OS-10

OS-11

OS-12

OS-13

R-1 MH

R-2 MH

R-3 MH

R-4 MH

R-5 MH

R-6 MH

R-7 MH

R-8 MH

R-9 MH

R-10 MH

P-1

S-1

CPF-1

CPF-2

P-2A COMMUNITY PARK

P-2B COMMUNITY PARK

OS-1

OS-2

OS-3

OS-4

OS-5

OS-6

N.A.P. (UNDERLYING DESIGNATION)

AR-11

SR-125

MSCP

FLOODPLAIN

FLOODWAY

SOIL NOT RATED OR NOT AVAILABLE

PRESSURE REDUCING STATION

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HYDROLOGIC SOIL TYPE LIMITS EXHIBIT

OTAY RANCH VILLAGE 8 EAST

CITY OF CHULA VISTA, CALIFORNIA

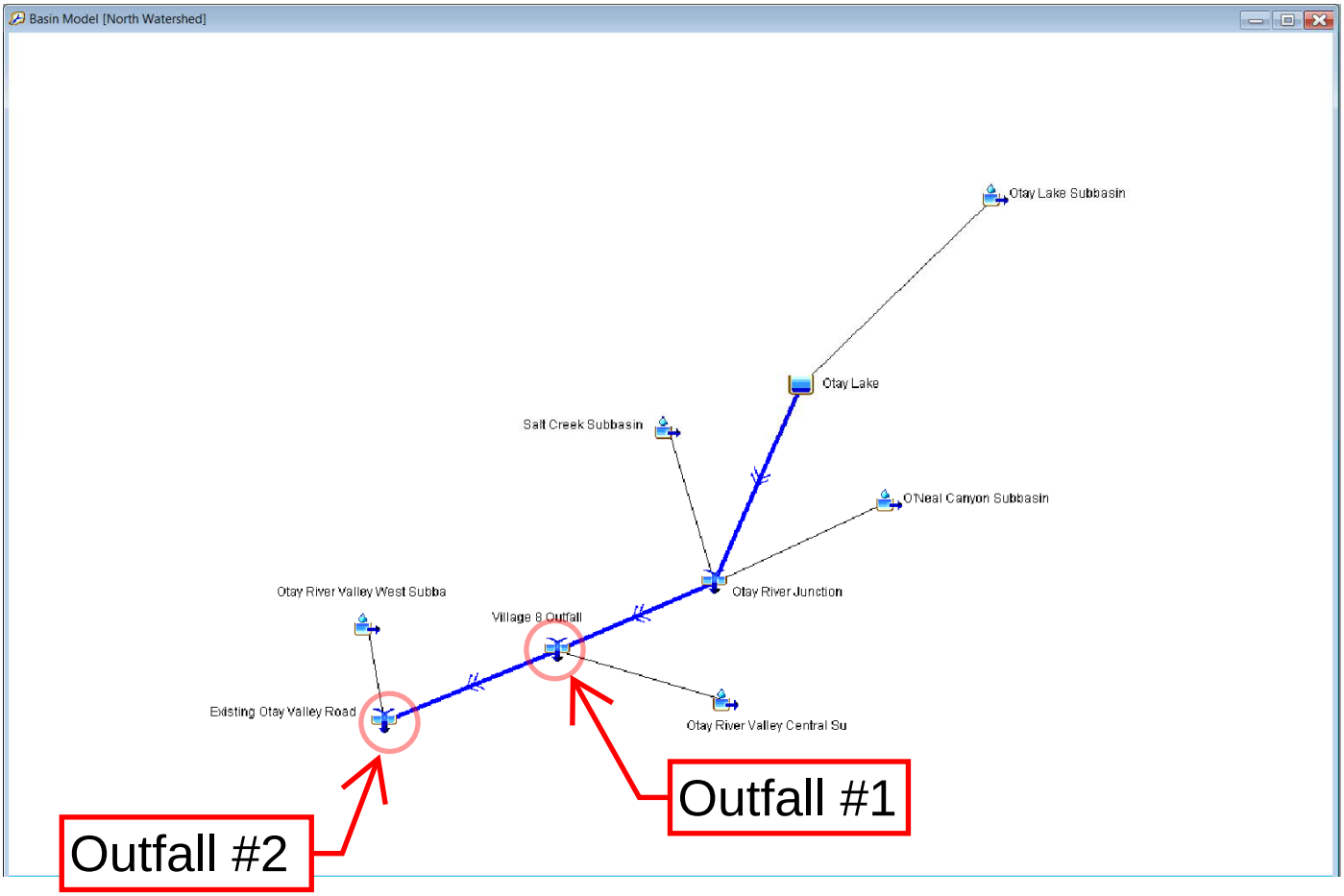
MAP 1 OF 1

w.o.# 2396-0039

APPENDIX A

HEC-HMS STUDY FOR OTAY RIVER WATERSHED FOR TIME TO PEAK DETERMINATION FOR 100-YEAR, 24-HOUR STORM EVENT

Otay River Valley Existing Condition HEC HMS Analysis



OTAY RANCH University Villages-Otay River Analysis
Otay Lake Subbasin & Reach

Existing Conditions

DRAINAGE AREA	62024.0 acres	
	96.913	mi^2

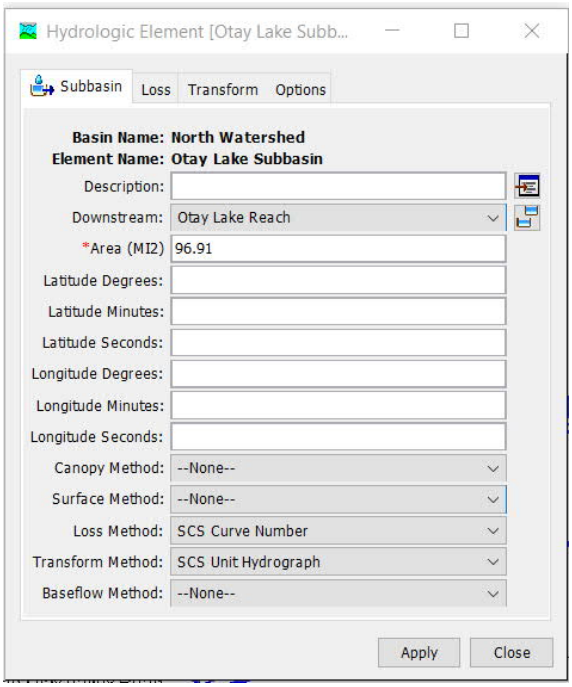
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	1024	acres	(Single-Family Residential Development)
81	86.5	61000	acres	(Open Space)

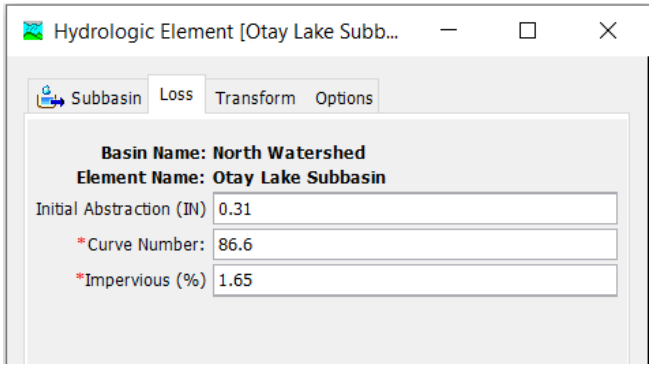
CURVE NUMBER =	81.1	PZN=2.0
Adjusted CN =	**86.6**	PZN=2.5

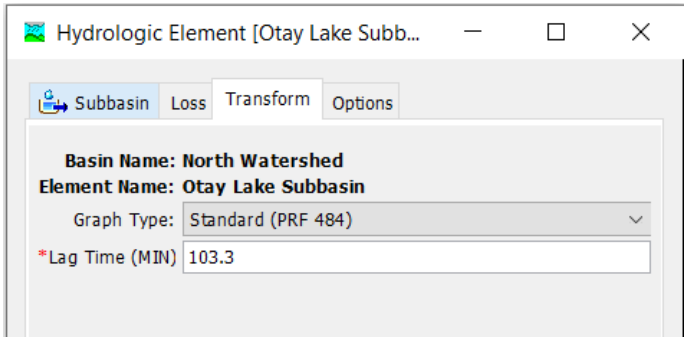
Average n	0.035			
m	0.38			
L	13.51	miles	71333	feet
Lc	6.755	miles	35666	feet
U/S Elev.	3060	feet		
D/S Elev.	486.4	feet		
S	190	ft/mile	0.036	ft/ft

LAG TIME =	**1.722**	**hours**
	103.3	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [Otay Lake Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay Lake Subbasin
Description:
Downstream: Otay Lake Reach
*Area (MI2) 96.91
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--
Apply
Close


Hydrologic Element [Otay Lake Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay Lake Subbasin
Initial Abstraction (IN) 0.31
*Curve Number: 86.6
*Impervious (%) 1.65


Hydrologic Element [Otay Lake Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay Lake Subbasin
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 103.3

OTAY RANCH VILLAGE 9 Otay River Analysis
Savage Dam Spillway Reach

Existing Conditions

DRAINAGE AREA	**0.0 acres**	
	0.000	**mi^2**

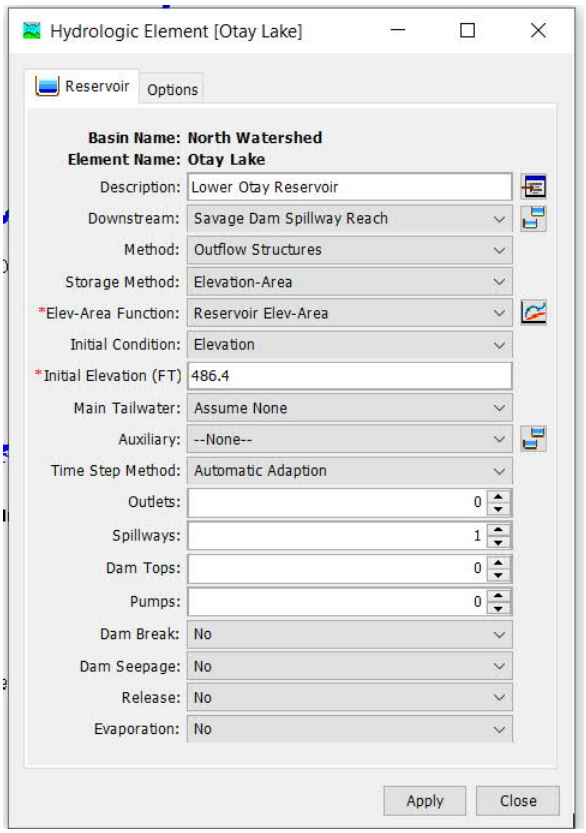
CN = 98	0	acres	(Major Arterials)
CN = 92	0	acres	(Commercial Development)
CN = 91	0	acres	(Mixed Use - Schools, Hospital)
CN = 90	0	acres	(High Density Residential Development)
CN = 87	0	acres	(Single-Family Residential Development)
CN = 81	0	acres	(Open Space)

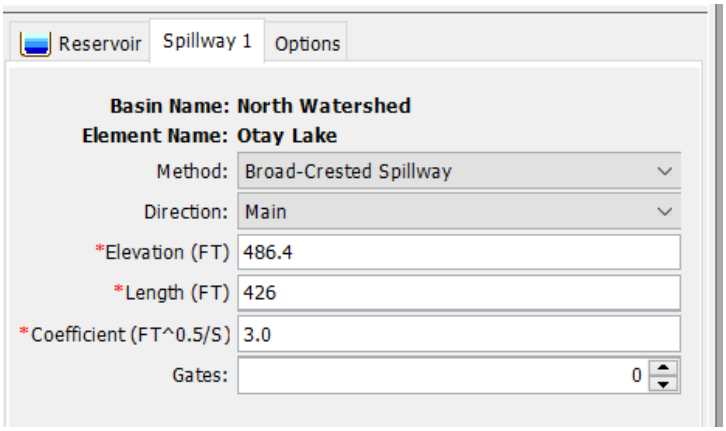
CURVE NUMBER =	81.0	AMC=2.0
	86.5	AMC=2.5

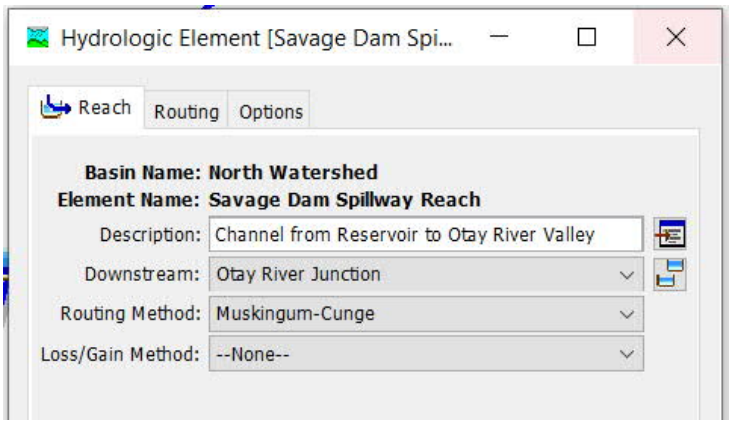
Average n	0.035			
m	0.38			
L	2.07	miles	10930	ft
Lc	1.035	miles	5465	ft
U/S Elev.	486	feet		
D/S Elev.	240	feet		
S	119	ft/mile	0.023	ft/ft

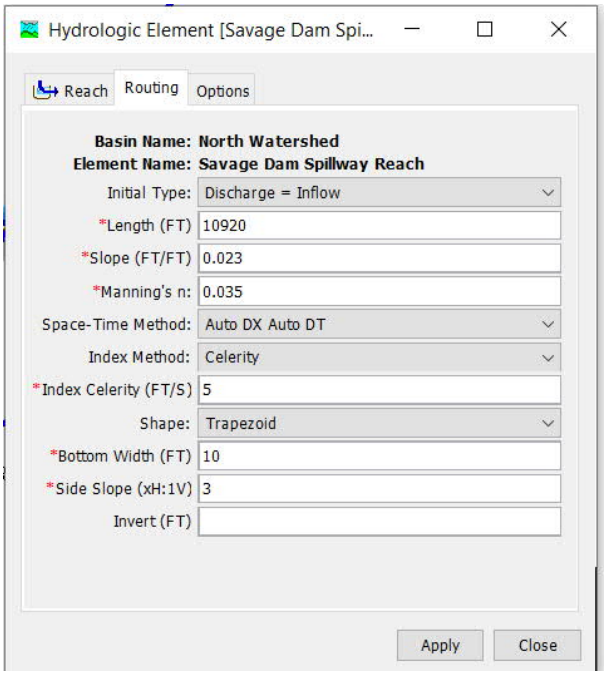
LAG TIME =	**0.453**	**hours**
	27.2	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [Otay Lake]
Reservoir
Options
Basin Name: North Watershed
Element Name: Otay Lake
Description: Lower Otay Reservoir
Downstream: Savage Dam Spillway Reach
Method: Outflow Structures
Storage Method: Elevation-Area
*Elev-Area Function: Reservoir Elev-Area
Initial Condition: Elevation
*Initial Elevation (FT) 486.4
Main Tailwater: Assume None
Auxiliary: --None--
Time Step Method: Automatic Adaption
Outlets: 0
Spillways: 1
Dam Tops: 0
Pumps: 0
Dam Break: No
Dam Seepage: No
Release: No
Evaporation: No
Apply
Close


Reservoir
Spillway 1
Options
Basin Name: North Watershed
Element Name: Otay Lake
Method: Broad-Crested Spillway
Direction: Main
*Elevation (FT) 486.4
*Length (FT) 426
*Coefficient (FT^0.5/S) 3.0
Gates: 0


Hydrologic Element [Savage Dam Spi...
Reach
Routing
Options
Basin Name: North Watershed
Element Name: Savage Dam Spillway Reach
Description: Channel from Reservoir to Otay River Valley
Downstream: Otay River Junction
Routing Method: Muskingum-Cunge
Loss/Gain Method: --None--


Hydrologic Element [Savage Dam Spi...
Reach
Routing
Options
Basin Name: North Watershed
Element Name: Savage Dam Spillway Reach
Initial Type: Discharge = Inflow
*Length (FT) 10920
*Slope (FT/FT) 0.023
*Manning's n: 0.035
Space-Time Method: Auto DX Auto DT
Index Method: Celerity
*Index Celerity (FT/S) 5
Shape: Trapezoid
*Bottom Width (FT) 10
*Side Slope (xH:1V) 3
Invert (FT)
Apply
Close

OTAY RANCH University Villages-Otay River Analysis
O'Neal Canyon Subbasin & Reach

Existing Conditions

DRAINAGE AREA	4822.0 acres	
	7.534	mi^2

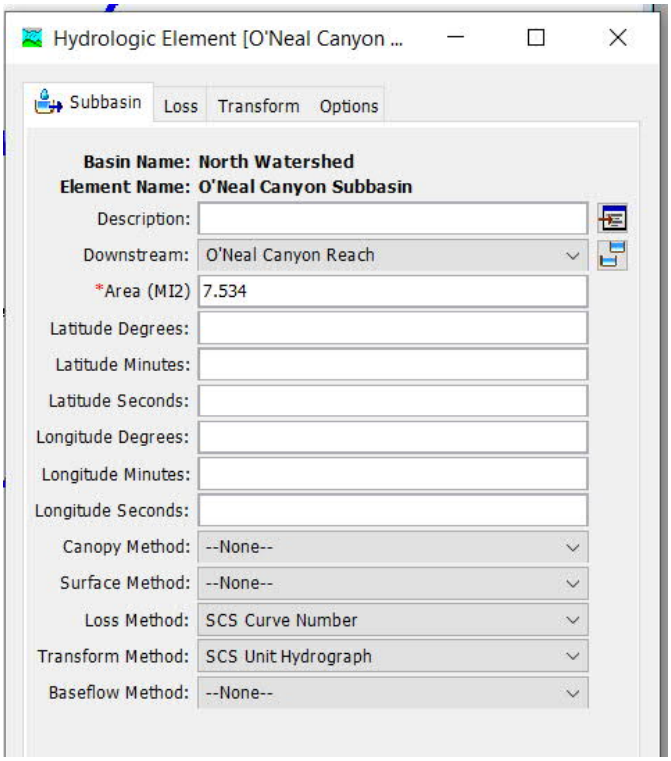
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	0	acres	(Single-Family Residential Development)
81	86.5	4822	acres	(Open Space)

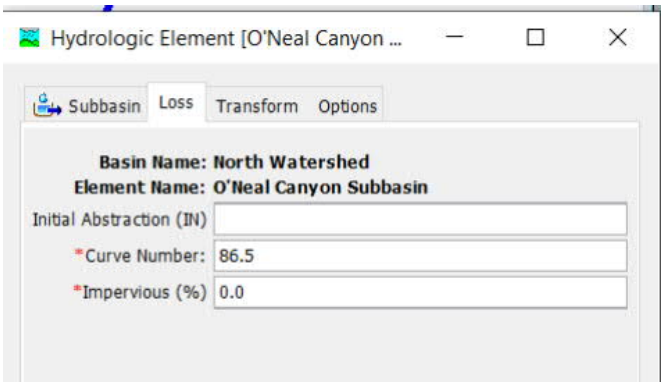
CURVE NUMBER =	81.0	PZN=2.0
Adjusted CN =	**86.5**	PZN=2.5

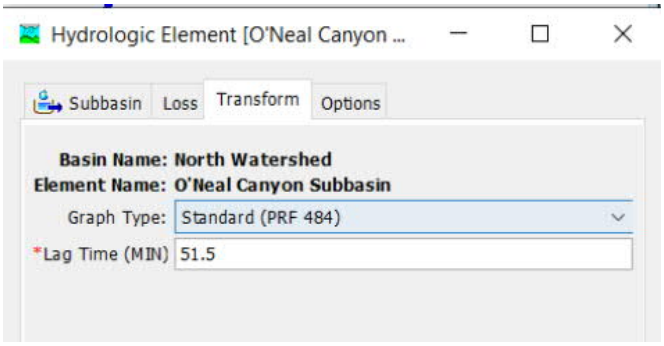
Average n	0.035			
m	0.38			
L	6.58	miles	34742	feet
Lc	3.29	miles	17371	feet
U/S Elev.	3000	feet		
D/S Elev.	240	feet		
S	419	ft/mile	0.079	ft/ft

LAG TIME =	**0.858**	**hours**
	51.5	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [O'Neal Canyon ...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: O'Neal Canyon Subbasin
Description:
Downstream: O'Neal Canyon Reach
*Area (MI2) 7.534
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [O'Neal Canyon ...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: O'Neal Canyon Subbasin
Initial Abstraction (IN)
*Curve Number: 86.5
*Impervious (%) 0.0


Hydrologic Element [O'Neal Canyon ...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: O'Neal Canyon Subbasin
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 51.5

OTAY RANCH University Villages-Otay River Analysis
Salt Creek Subbasin & Reach

Existing Conditions

DRAINAGE AREA	3338.0 acres	
	5.216	mi^2

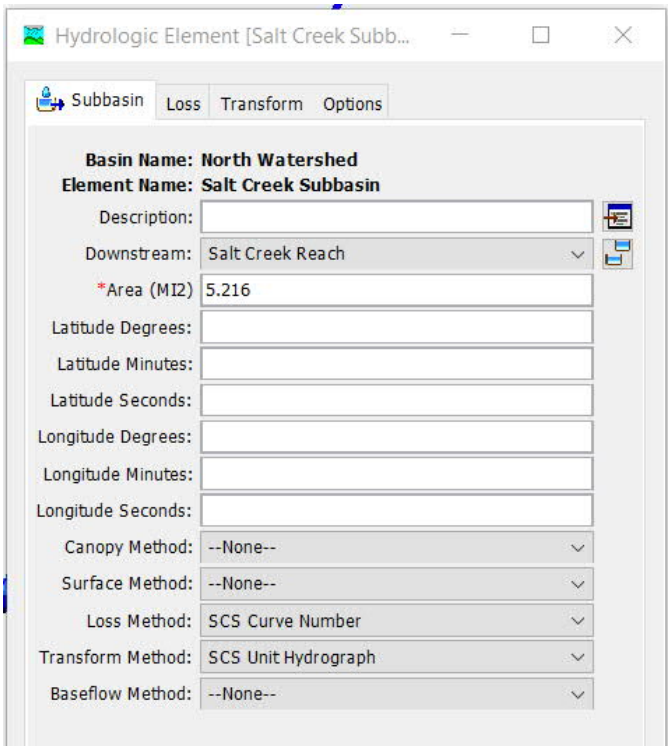
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	2237	acres	(Single-Family Residential Development)
81	86.5	1101	acres	(Open Space)

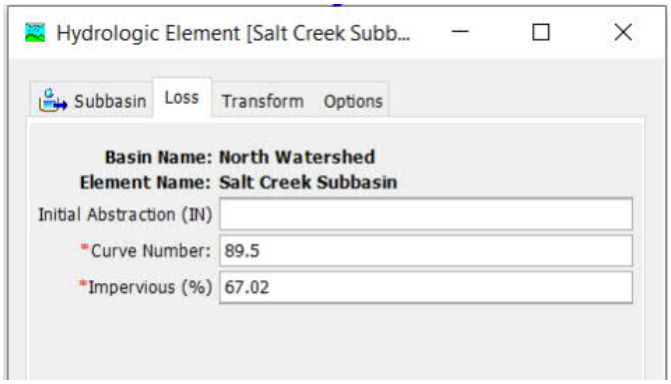
CURVE NUMBER =	85.0	PZN=2.0
Adjusted CN =	**89.5**	PZN=2.5

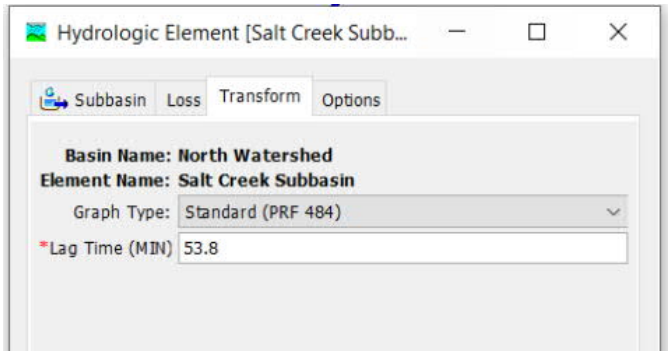
Average n	0.035			
m	0.38			
L	5.98	miles	31574	feet
Lc	2.99	miles	15787	feet
U/S Elev.	1600	feet		
D/S Elev.	240	feet		
S	227	ft/mile	0.043	ft/ft

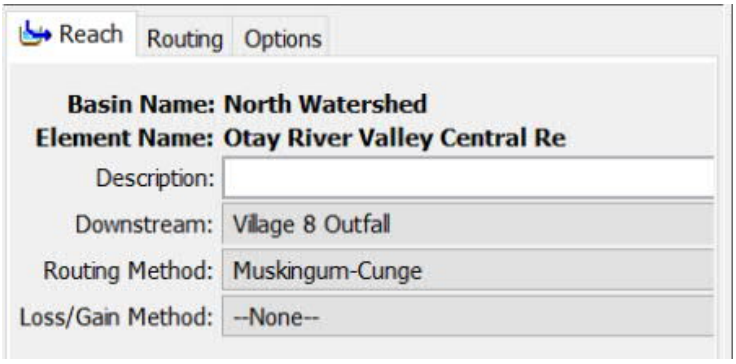
LAG TIME =	**0.896**	**hours**
	53.8	**min**

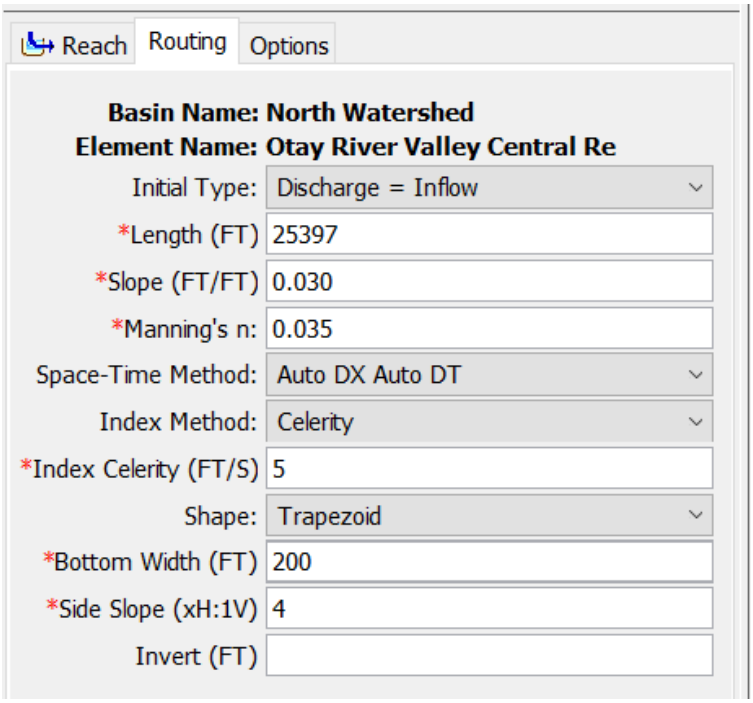
SOIL GROUP D ASSUMED


Hydrologic Element [Salt Creek Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Salt Creek Subbasin
Description:
Downstream: Salt Creek Reach
*Area (MI2) 5.216
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [Salt Creek Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Salt Creek Subbasin
Initial Abstraction (IN)
*Curve Number: 89.5
*Impervious (%) 67.02


Hydrologic Element [Salt Creek Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Salt Creek Subbasin
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 53.8


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Re
Description:
Downstream: Village 8 Outfall
Routing Method: Muskingum-Cunge
Loss/Gain Method: --None--


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Re
Initial Type: Discharge = Inflow
*Length (FT) 25397
*Slope (FT/FT) 0.030
*Manning's n: 0.035
Space-Time Method: Auto DX Auto DT
Index Method: Celerity
*Index Celerity (FT/S) 5
Shape: Trapezoid
*Bottom Width (FT) 200
*Side Slope (xH:1V) 4
Invert (FT)

OTAY RANCH University Villages-Otay River Analysis
Otay River Valley Central Subbasin

Existing Conditions

DRAINAGE AREA	**4028.0 acres**	
	6.294	**mi^2**

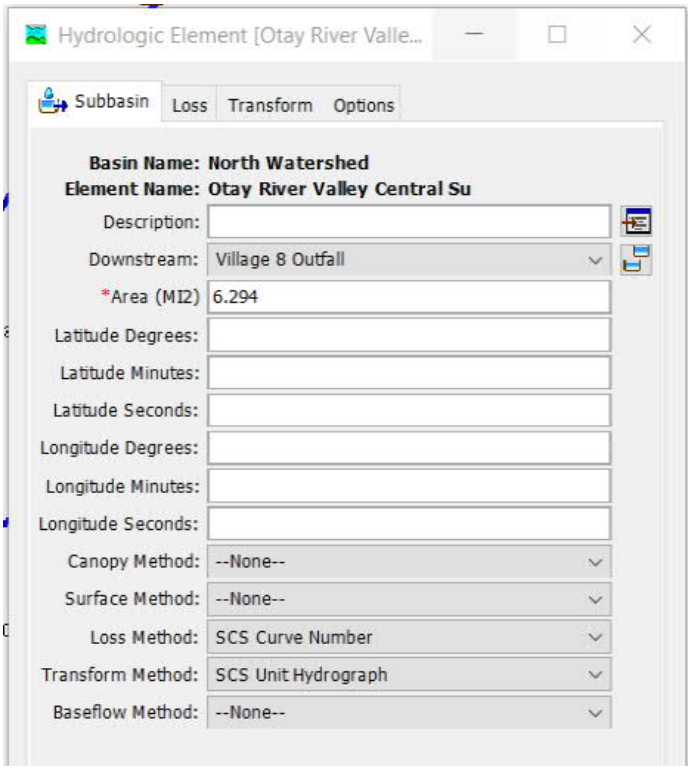
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	996	acres	(Single-Family Residential Development)
81	86.5	3032	acres	(Open Space)

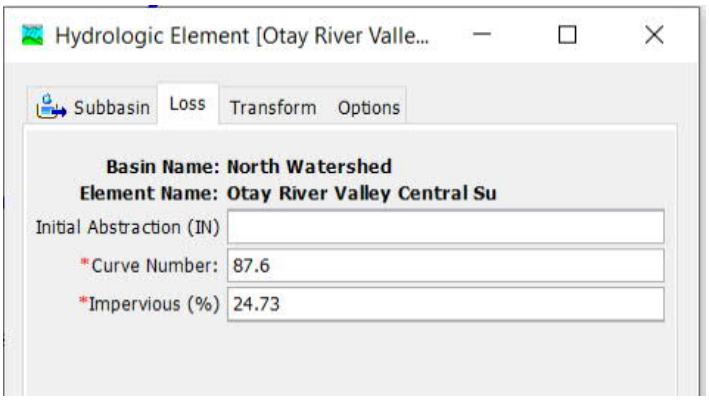
CURVE NUMBER =	82.5	PZN=2.0
Adjusted CN =	**87.6**	PZN=2.5

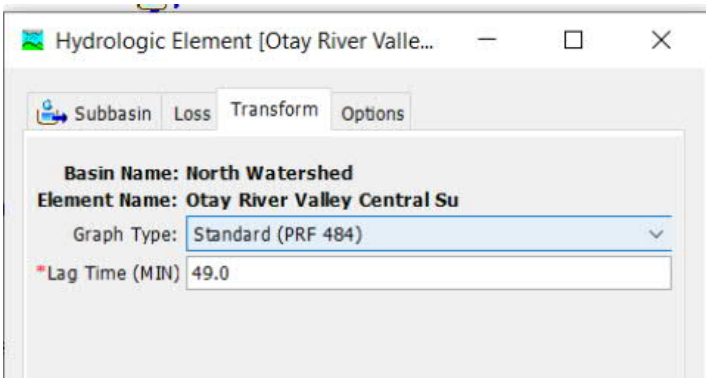
Average n	0.035			
m	0.38			
L	4.81	miles	25397	feet
Lc	2.405	miles	12698	feet
U/S Elev.	940	feet		
D/S Elev.	190	feet		
S	156	ft/mile	0.030	ft/ft

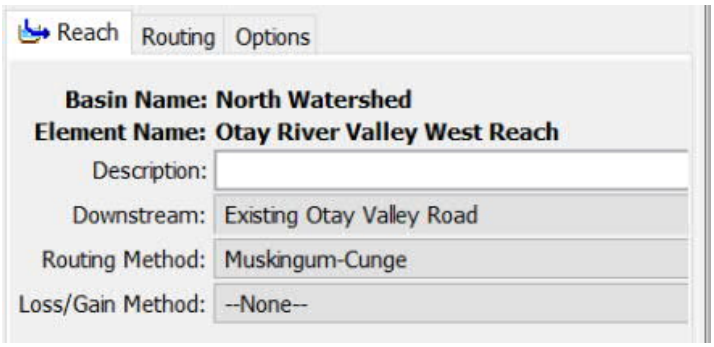
LAG TIME =	**0.816**	**hours**
	49.0	**min**

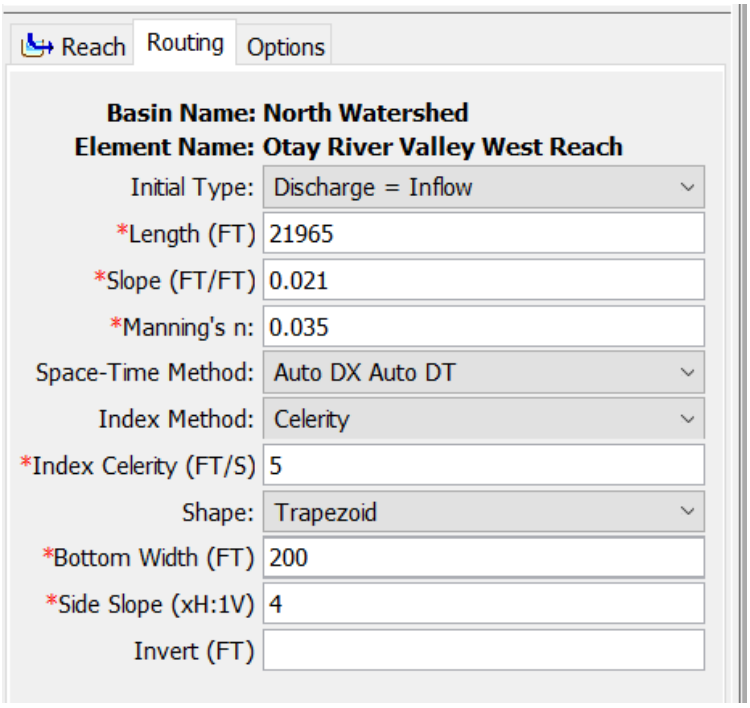
SOIL GROUP D ASSUMED


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Su
Description:
Downstream: Village 8 Outfall
*Area (MI2) 6.294
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Su
Initial Abstraction (IN)
*Curve Number: 87.6
*Impervious (%) 24.73


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Su
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 49.0


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Reach
Description:
Downstream: Existing Otay Valley Road
Routing Method: Muskingum-Cunge
Loss/Gain Method: --None--


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Reach
Initial Type: Discharge = Inflow
*Length (FT) 21965
*Slope (FT/FT) 0.021
*Manning's n: 0.035
Space-Time Method: Auto DX Auto DT
Index Method: Celerity
*Index Celerity (FT/S) 5
Shape: Trapezoid
*Bottom Width (FT) 200
*Side Slope (xH:1V) 4
Invert (FT)

OTAY RANCH University Villages-Otay River Analysis
Otay River Valley West Reach

Existing Conditions

DRAINAGE AREA	**3143.0 acres**	
	4.911	**mi^2**

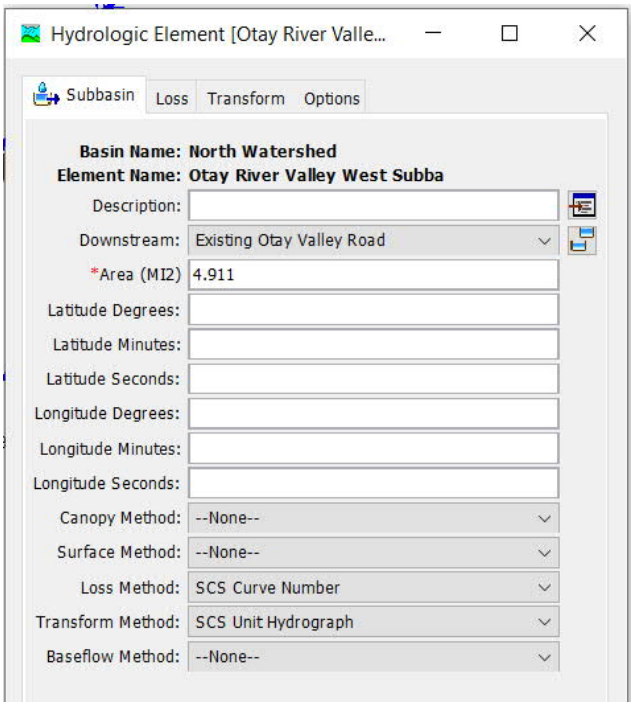
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	1237	acres	(Single-Family Residential Development)
81	86.5	1906	acres	(Open Space)

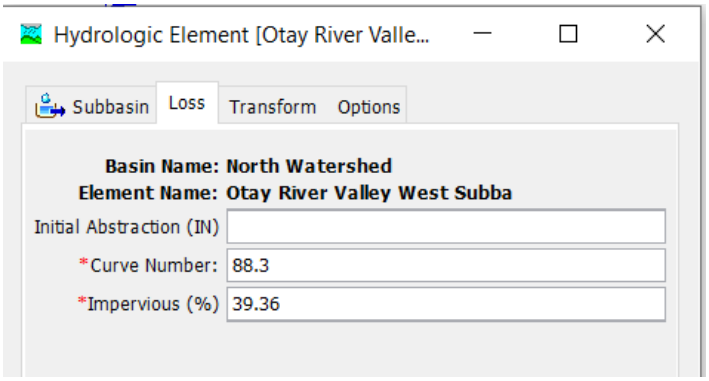
CURVE NUMBER =	83.4	PZN=2.0
Adjusted CN =	**88.3**	PZN=2.5

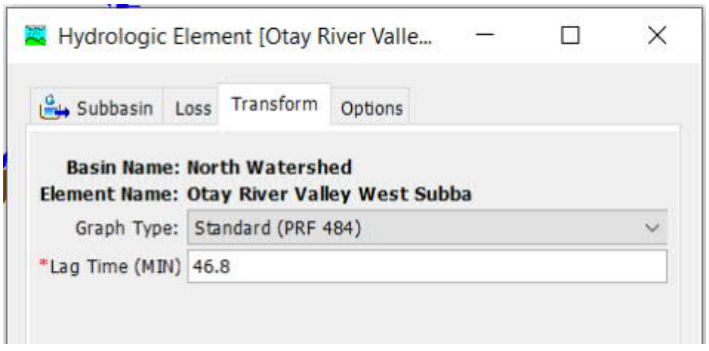
Average n	0.035			
m	0.38			
L	4.16	miles	21965	feet
Lc	2.08	miles	10982	feet
U/S Elev.	600	feet		
D/S Elev.	140	feet		
S	111	ft/mile	0.021	ft/ft

LAG TIME =	**0.780**	**hours**
	46.8	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Subba
Description:
Downstream: Existing Otay Valley Road
*Area (MI2) 4.911
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Subba
Initial Abstraction (IN)
*Curve Number: 88.3
*Impervious (%) 39.36


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Subba
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 46.8

Global Summary Results for Run "100 Year 6 Hour"

Project: 0920-Village 8 East_Ex Simulation Run: 100 Year 6 Hour

Start of Run: 01Jan2011, 00:00
End of Run: 08Jan2011, 00:00
Compute Time: 03Jul2023, 17:08:08

Basin Model: North Watershed
Meteorologic Model: 100 Year 6 Hour
Control Specifications: 100 Year

Show Elements: All Elements Volume Units: (●) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Otay Lake Subbasin	96.910	22322.76	01Jan2011, 06:00	1.11
Otay Lake	96.910	6699.05	01Jan2011, 08:15	1.10
Savage Dam Spillwa...	96.910	6698.91	01Jan2011, 08:25	1.10
O'Neal Canyon Subb...	7.534	2523.08	01Jan2011, 05:00	1.08
Salt Creek Subbasin	5.216	2569.81	01Jan2011, 05:00	1.94
Otay River Junction	109.660	6800.40	01Jan2011, 08:15	1.14
Otay River Valley Ce...	109.660	6800.25	01Jan2011, 08:35	1.14
Otay River Valley Ce...	6.294	2613.91	01Jan2011, 04:55	1.43
Village 8 Outfall	115.954	7479.22	01Jan2011, 05:20	1.16
Otay River Valley W...	115.954	7517.81	01Jan2011, 05:35	1.16
Otay River Valley W...	4.911	2280.43	01Jan2011, 04:55	1.62
Existing Otay Valley ...	120.865	9016.74	01Jan2011, 05:30	1.17

Global Summary Results for Run "100 Year 24 Hour"

Project: 0920-Village 8 East_Ex Simulation Run: 100 Year 24 Hour

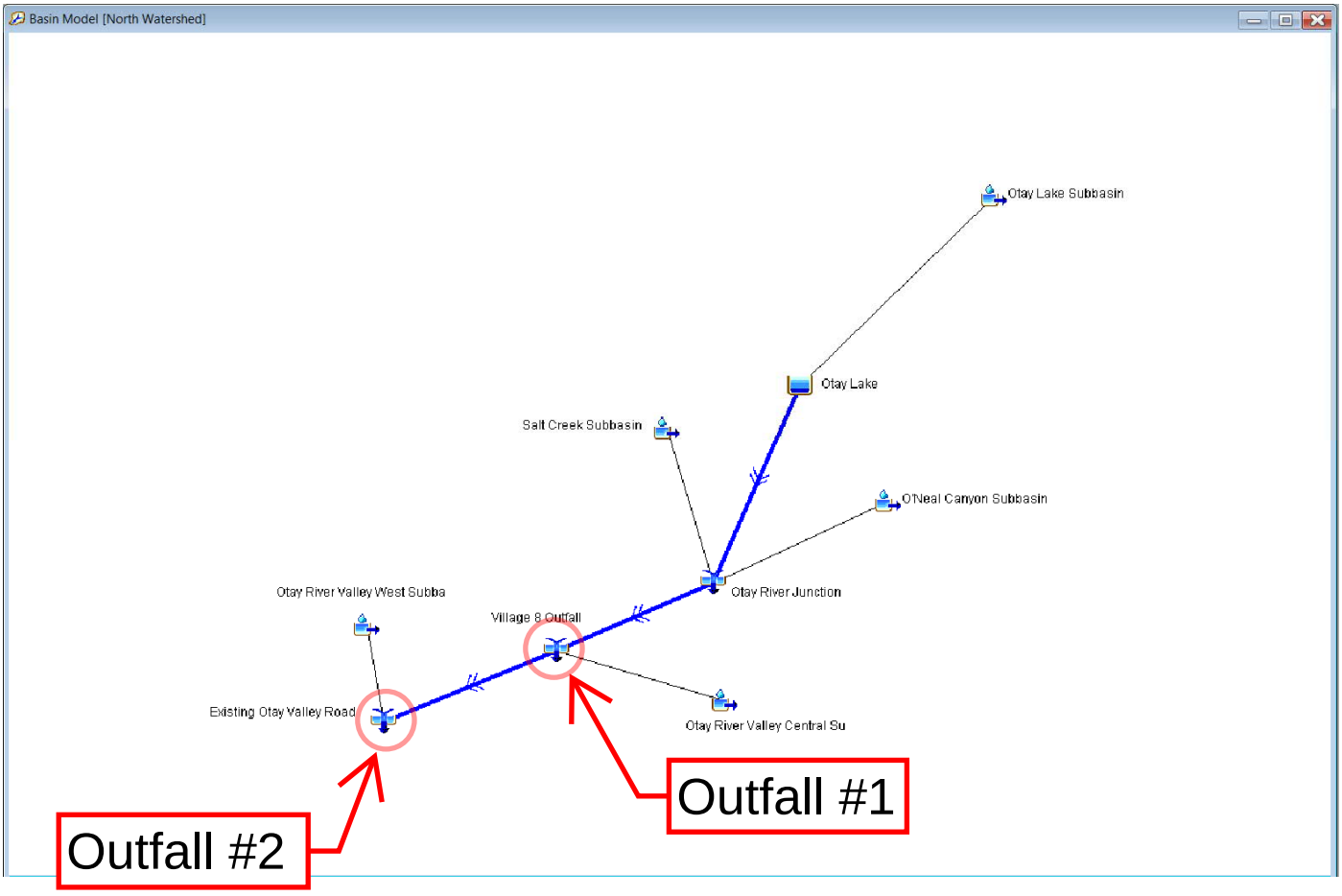
Start of Run: 01Jan2011, 00:00
End of Run: 08Jan2011, 00:00
Compute Time: 03Jul2023, 17:07:59

Basin Model: North Watershed
Meteorologic Model: 100 Year 24 Hour
Control Specifications: 100 Year

Show Elements: All Elements Volume Units: (●) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Otay Lake Subbasin	96.910	32860.72	01Jan2011, 17:50	3.66
Otay Lake	96.910	16958.13	01Jan2011, 19:55	3.66
Savage Dam Spillwa...	96.910	16958.47	01Jan2011, 20:00	3.66
O'Neal Canyon Subb...	7.534	3627.00	01Jan2011, 16:55	3.63
Salt Creek Subbasin	5.216	2770.29	01Jan2011, 17:00	4.73
Otay River Junction	109.660	18709.33	01Jan2011, 20:10	3.71
Otay River Valley Ce...	109.660	18710.28	01Jan2011, 20:25	3.71
Otay River Valley Ce...	6.294	3281.77	01Jan2011, 16:55	4.08
Village 8 Outfall	115.954	19619.13	01Jan2011, 20:30	3.73
Otay River Valley W...	115.954	19618.96	01Jan2011, 20:40	3.73
Otay River Valley W...	4.911	2687.46	01Jan2011, 16:50	4.33
Existing Otay Valley ...	120.865	20345.45	01Jan2011, 20:40	3.75

Otay River Valley Proposed Condition HEC HMS Analysis



OTAY RANCH University Villages-Otay River Analysis
Otay Lake Subbasin & Reach

Existing Conditions

DRAINAGE AREA	62024.0 acres	
	96.913	mi^2

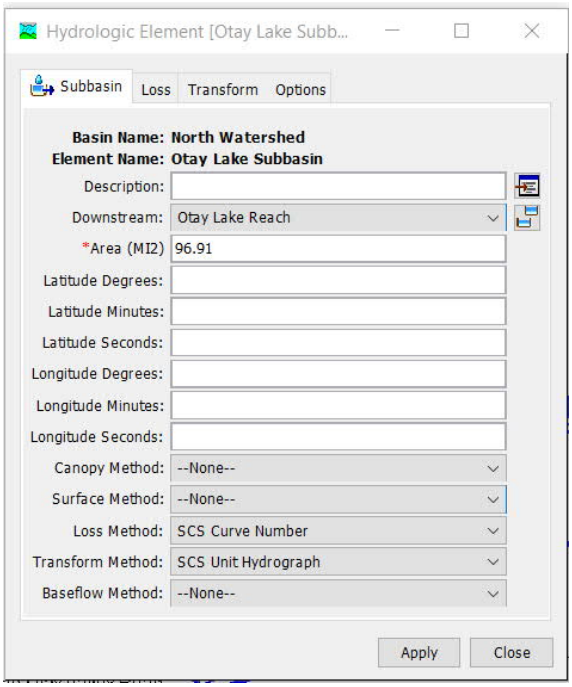
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	1024	acres	(Single-Family Residential Development)
81	86.5	61000	acres	(Open Space)

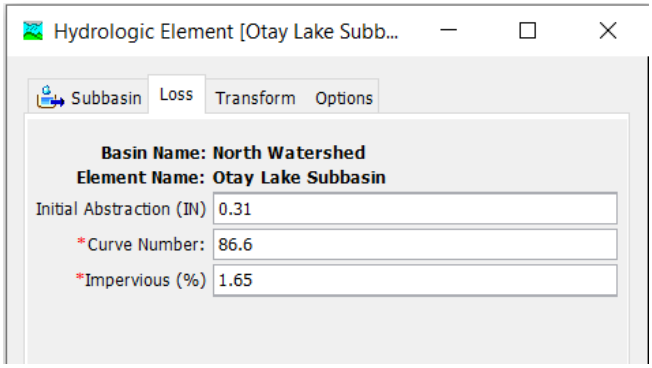
CURVE NUMBER =	81.1	PZN=2.0
Adjusted CN =	**86.6**	PZN=2.5

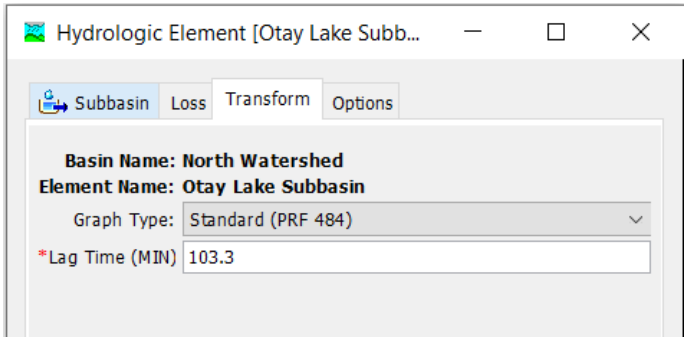
Average n	0.035			
m	0.38			
L	13.51	miles	71333	ft
Lc	6.755	miles	35666	ft
U/S Elev.	3060	feet		
D/S Elev.	486.4	feet		
S	190	ft/mile	0.036	ft/ft

LAG TIME =	**1.722**	**hours**
	103.3	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [Otay Lake Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay Lake Subbasin
Description:
Downstream: Otay Lake Reach
*Area (MI2) 96.91
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--
Apply
Close


Hydrologic Element [Otay Lake Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay Lake Subbasin
Initial Abstraction (IN) 0.31
*Curve Number: 86.6
*Impervious (%) 1.65


Hydrologic Element [Otay Lake Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay Lake Subbasin
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 103.3

OTAY RANCH VILLAGE 9 Otay River Analysis
Savage Dam Spillway Reach

Existing Conditions

DRAINAGE AREA	**0.0 acres**	
	0.000	**mi^2**

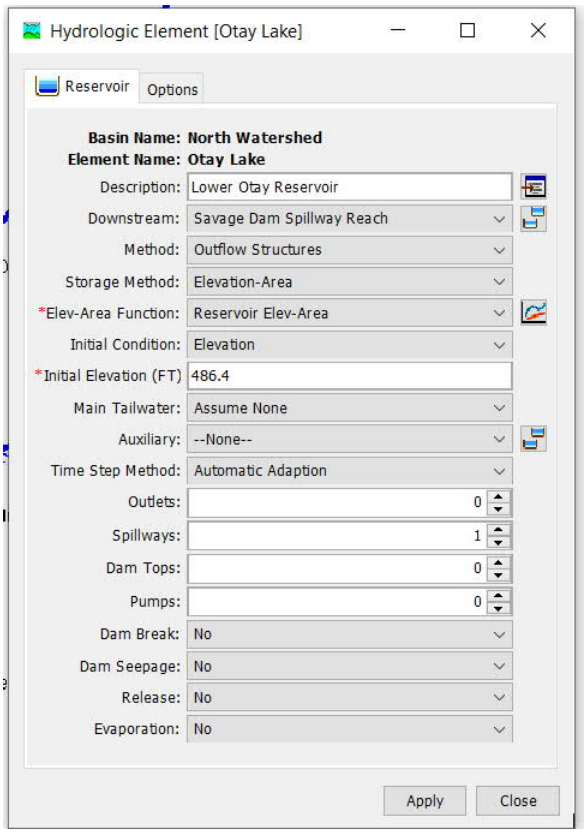
CN = 98	0	acres	(Major Arterials)
CN = 92	0	acres	(Commercial Development)
CN = 91	0	acres	(Mixed Use - Schools, Hospital)
CN = 90	0	acres	(High Density Residential Development)
CN = 87	0	acres	(Single-Family Residential Development)
CN = 81	0	acres	(Open Space)

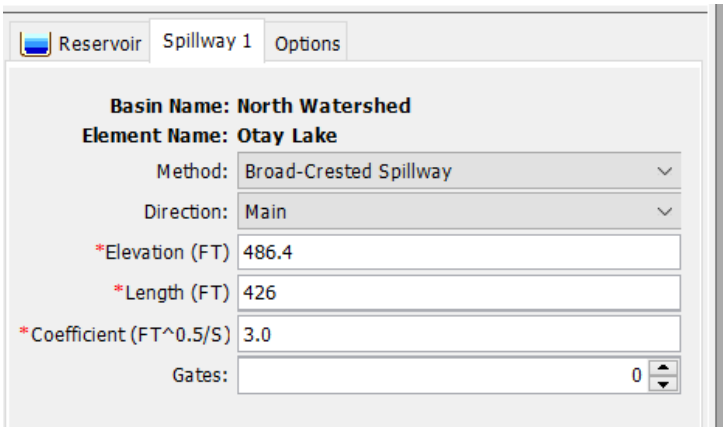
CURVE NUMBER =	81.0	AMC=2.0
	86.5	AMC=2.5

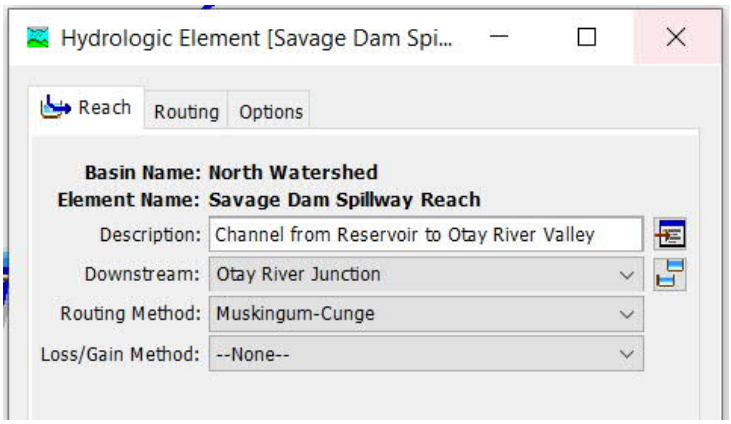
Average n	0.035			
m	0.38			
L	2.07	miles	10930	ft
Lc	1.035	miles	5465	ft
U/S Elev.	486	feet		
D/S Elev.	240	feet		
S	119	ft/mile	0.023	ft/ft

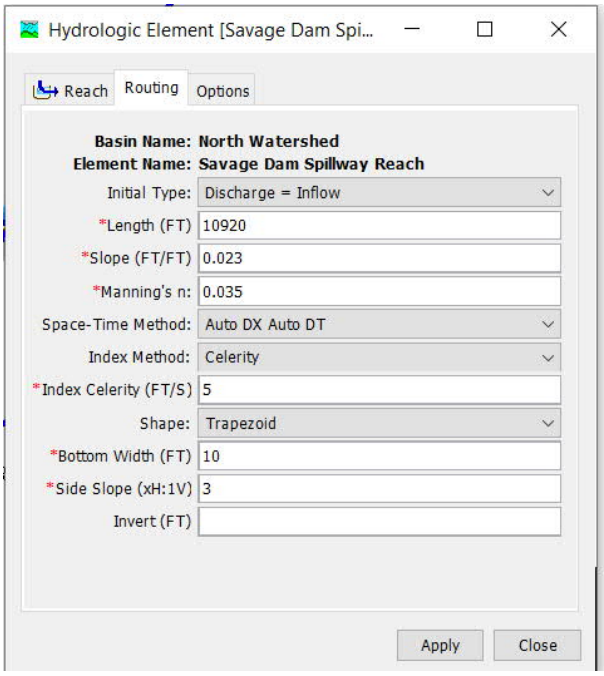
LAG TIME =	**0.453**	**hours**
	27.2	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [Otay Lake]
Reservoir
Options
Basin Name: North Watershed
Element Name: Otay Lake
Description: Lower Otay Reservoir
Downstream: Savage Dam Spillway Reach
Method: Outflow Structures
Storage Method: Elevation-Area
*Elev-Area Function: Reservoir Elev-Area
Initial Condition: Elevation
*Initial Elevation (FT) 486.4
Main Tailwater: Assume None
Auxiliary: --None--
Time Step Method: Automatic Adaption
Outlets: 0
Spillways: 1
Dam Tops: 0
Pumps: 0
Dam Break: No
Dam Seepage: No
Release: No
Evaporation: No
Apply
Close


Reservoir
Spillway 1
Options
Basin Name: North Watershed
Element Name: Otay Lake
Method: Broad-Crested Spillway
Direction: Main
*Elevation (FT) 486.4
*Length (FT) 426
*Coefficient (FT^0.5/S) 3.0
Gates: 0


Hydrologic Element [Savage Dam Spi...
Reach
Routing
Options
Basin Name: North Watershed
Element Name: Savage Dam Spillway Reach
Description: Channel from Reservoir to Otay River Valley
Downstream: Otay River Junction
Routing Method: Muskingum-Cunge
Loss/Gain Method: --None--


Hydrologic Element [Savage Dam Spi...
Reach
Routing
Options
Basin Name: North Watershed
Element Name: Savage Dam Spillway Reach
Initial Type: Discharge = Inflow
*Length (FT) 10920
*Slope (FT/FT) 0.023
*Manning's n: 0.035
Space-Time Method: Auto DX Auto DT
Index Method: Celerity
*Index Celerity (FT/S) 5
Shape: Trapezoid
*Bottom Width (FT) 10
*Side Slope (xH:1V) 3
Invert (FT)
Apply
Close

OTAY RANCH University Villages-Otay River Analysis
O'Neal Canyon Subbasin & Reach

Existing Conditions

DRAINAGE AREA	4822.0 acres	
	7.534	mi^2

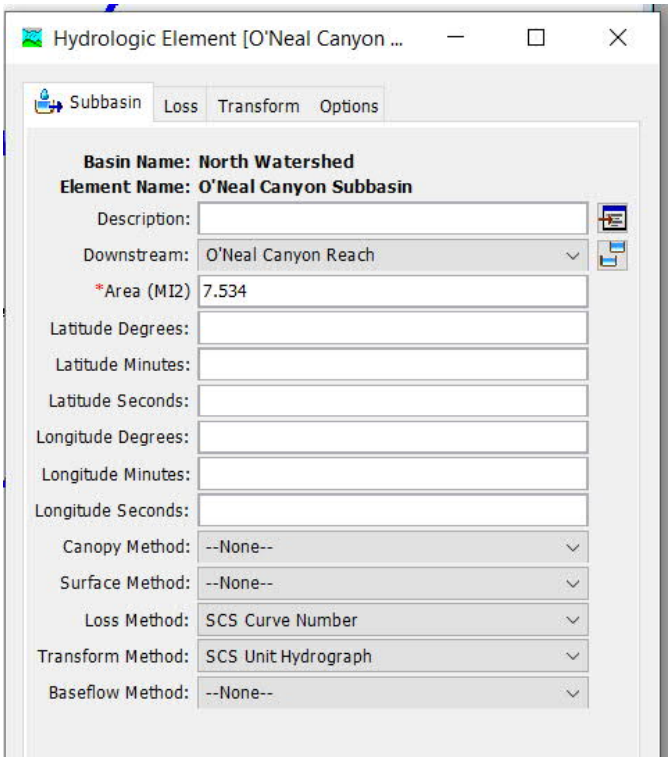
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	0	acres	(Single-Family Residential Development)
81	86.5	4822	acres	(Open Space)

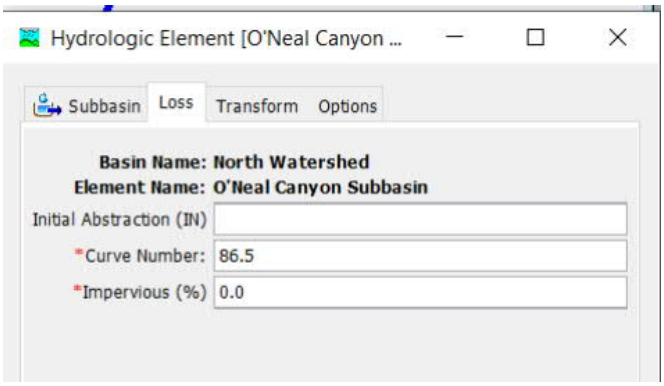
CURVE NUMBER =	81.0	PZN=2.0
Adjusted CN =	**86.5**	PZN=2.5

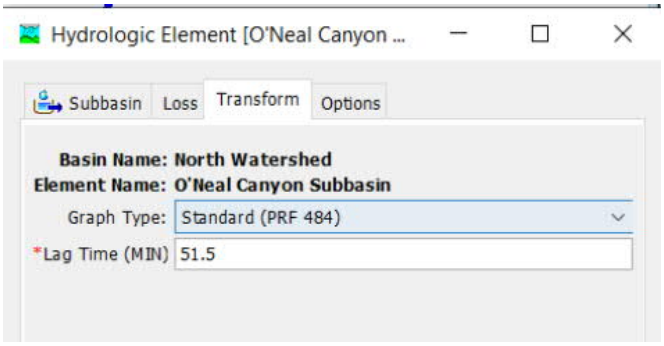
Average n	0.035			
m	0.38			
L	6.58	miles	34742	ft
Lc	3.29	miles	17371	ft
U/S Elev.	3000	feet		
D/S Elev.	240	feet		
S	419	ft/mile	0.079	ft/ft

LAG TIME =	**0.858**	**hours**
	51.5	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [O'Neal Canyon ...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: O'Neal Canyon Subbasin
Description:
Downstream: O'Neal Canyon Reach
*Area (MI2) 7.534
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [O'Neal Canyon ...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: O'Neal Canyon Subbasin
Initial Abstraction (IN)
*Curve Number: 86.5
*Impervious (%) 0.0


Hydrologic Element [O'Neal Canyon ...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: O'Neal Canyon Subbasin
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 51.5

OTAY RANCH University Villages-Otay River Analysis
Salt Creek Subbasin & Reach

Existing Conditions

DRAINAGE AREA	3338.0 acres	
	5.216	mi^2

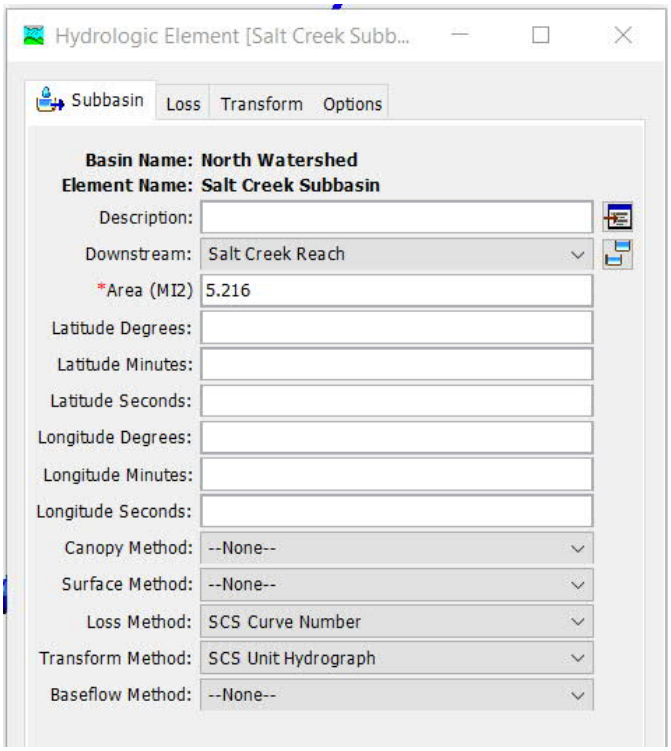
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	2237	acres	(Single-Family Residential Development)
81	86.5	1101	acres	(Open Space)

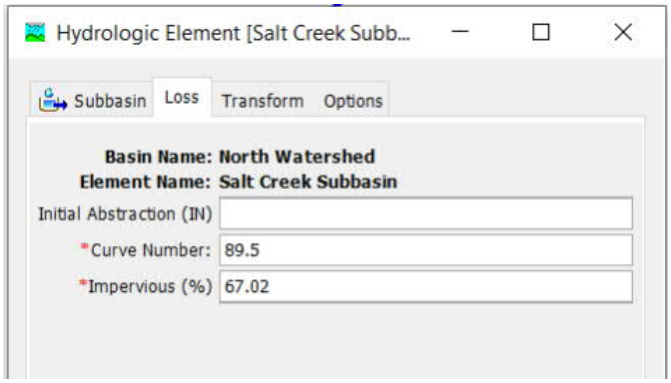
CURVE NUMBER =	85.0	PZN=2.0
Adjusted CN =	**89.5**	PZN=2.5

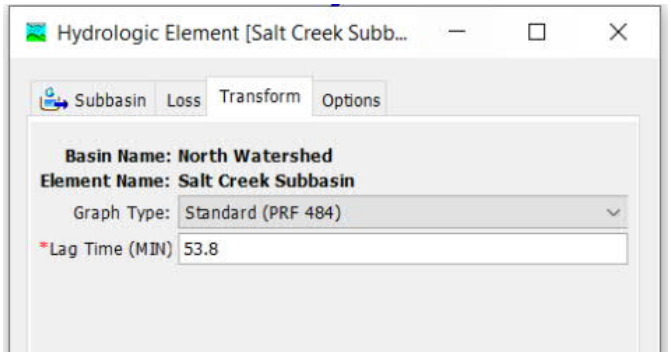
Average n	0.035			
m	0.38			
L	5.98	miles	31574	ft
Lc	2.99	miles	15787	ft
U/S Elev.	1600	feet		
D/S Elev.	240	feet		
S	227	ft/mile	0.043	ft/ft

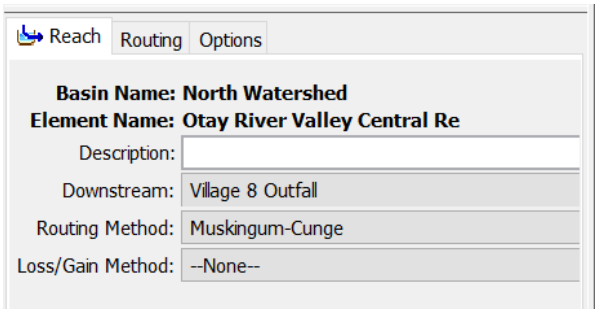
LAG TIME =	**0.896**	**hours**
	53.8	**min**

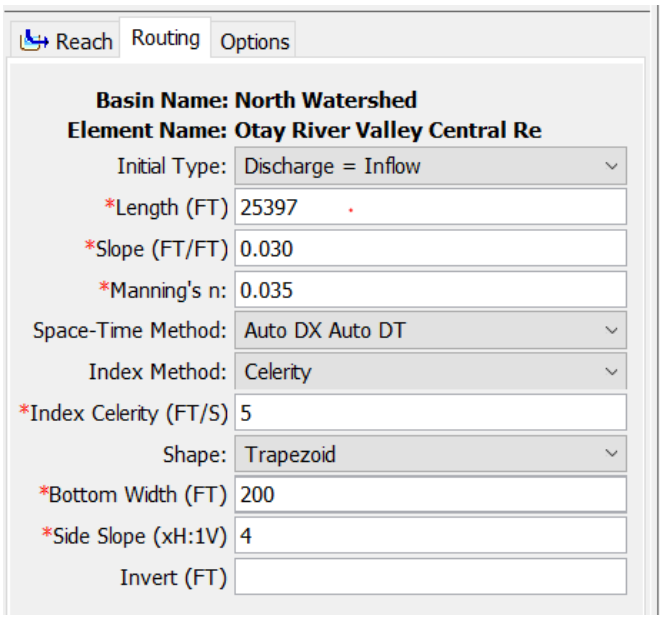
SOIL GROUP D ASSUMED


Hydrologic Element [Salt Creek Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Salt Creek Subbasin
Description:
Downstream: Salt Creek Reach
*Area (MI2) 5.216
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [Salt Creek Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Salt Creek Subbasin
Initial Abstraction (IN)
*Curve Number: 89.5
*Impervious (%) 67.02


Hydrologic Element [Salt Creek Subb...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Salt Creek Subbasin
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 53.8


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Re
Description:
Downstream: Village 8 Outfall
Routing Method: Muskingum-Cunge
Loss/Gain Method: --None--


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Re
Initial Type: Discharge = Inflow
*Length (FT) 25397
*Slope (FT/FT) 0.030
*Manning's n: 0.035
Space-Time Method: Auto DX Auto DT
Index Method: Celerity
*Index Celerity (FT/S) 5
Shape: Trapezoid
*Bottom Width (FT) 200
*Side Slope (xH:1V) 4
Invert (FT)

OTAY RANCH University Villages-Otay River Analysis
Otay River Valley Central Subbasin

Existing Conditions

DRAINAGE AREA	**4028.0 acres**	
	6.294	**mi^2**

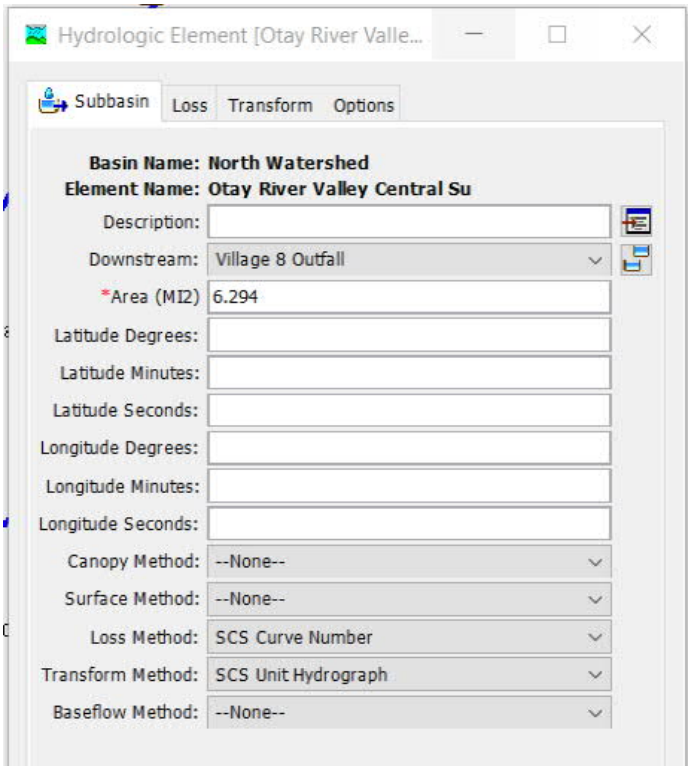
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	1256	acres	(Single-Family Residential Development)
81	86.5	2772	acres	(Open Space)

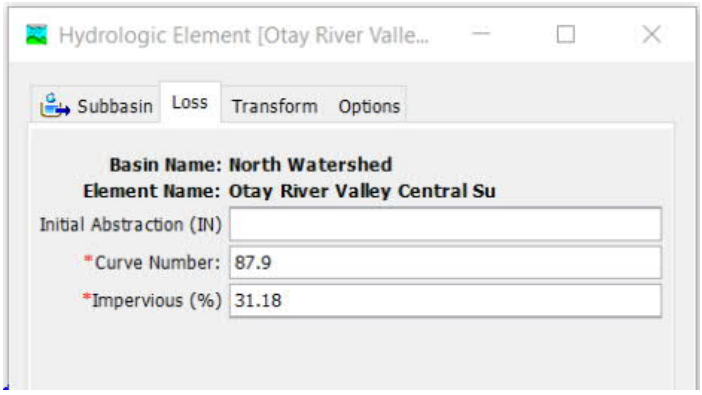
CURVE NUMBER =	82.9	PZN=2.0
Adjusted CN =	**87.9**	PZN=2.5

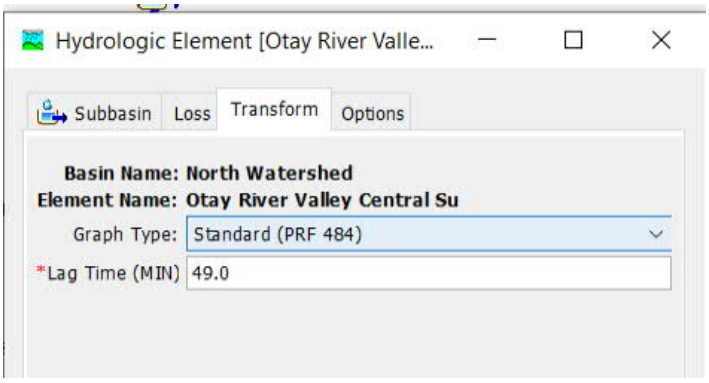
Average n	0.035			
m	0.38			
L	4.81	miles	25397	ft
Lc	2.405	miles	12698	ft
U/S Elev.	940	feet		
D/S Elev.	190	feet		
S	156	ft/mile	0.030	ft/ft

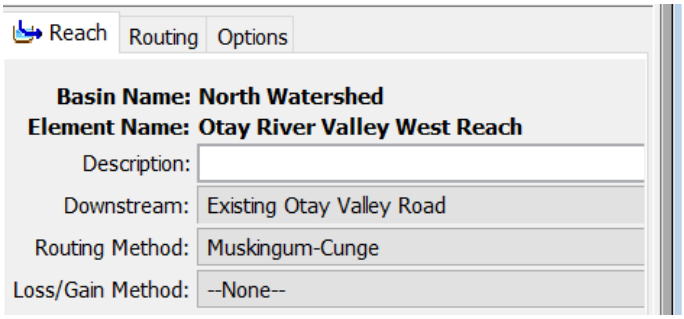
LAG TIME =	**0.816**	**hours**
	49.0	**min**

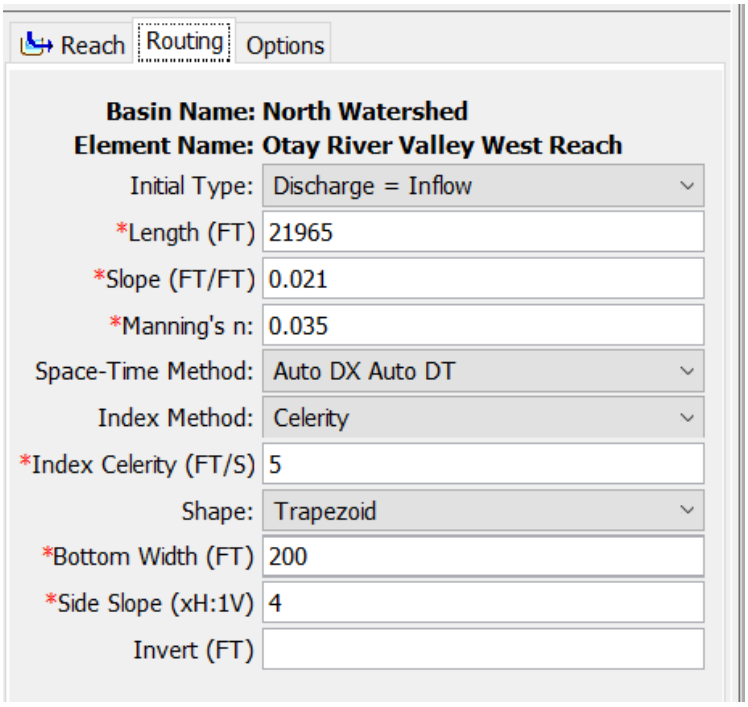
SOIL GROUP D ASSUMED


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Su
Description:
Downstream: Village 8 Outfall
*Area (MI2) 6.294
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Su
Initial Abstraction (IN)
*Curve Number: 87.9
*Impervious (%) 31.18


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley Central Su
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 49.0


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Reach
Description:
Downstream: Existing Otay Valley Road
Routing Method: Muskingum-Cunge
Loss/Gain Method: --None--


Reach
Routing
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Reach
Initial Type: Discharge = Inflow
*Length (FT) 21965
*Slope (FT/FT) 0.021
*Manning's n: 0.035
Space-Time Method: Auto DX Auto DT
Index Method: Celerity
*Index Celerity (FT/S) 5
Shape: Trapezoid
*Bottom Width (FT) 200
*Side Slope (xH:1V) 4
Invert (FT)

OTAY RANCH University Villages-Otay River Analysis
Otay River Valley West Reach

Existing Conditions

DRAINAGE	**3143.0 acres**	
AREA	**4.911**	**mi^2**

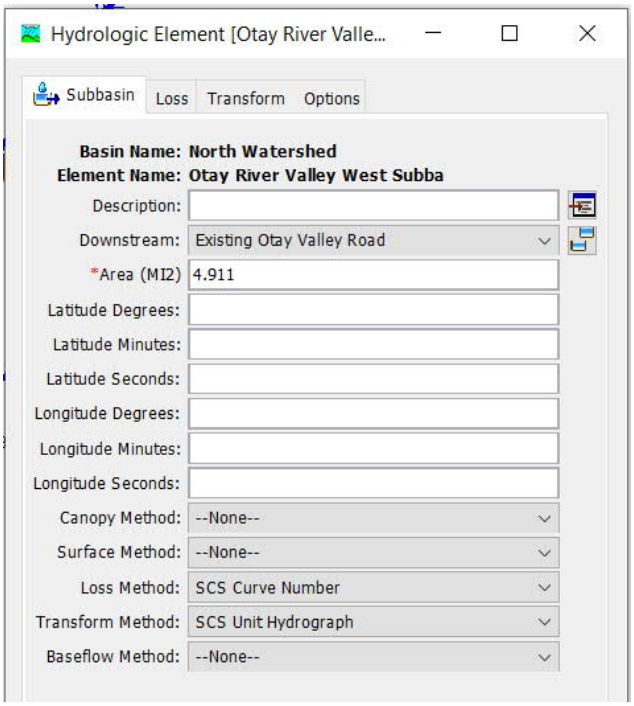
PZN=2.0	PZN=2.5			
98	98.5	0	acres	(Major Arterials)
92	94.5	0	acres	(Commercial Development)
91	94	0	acres	(Mixed Use - Schools, Hospital)
90	93	0	acres	(High Density Residential Development)
87	91	1237	acres	(Single-Family Residential Development)
81	86.5	1906	acres	(Open Space)

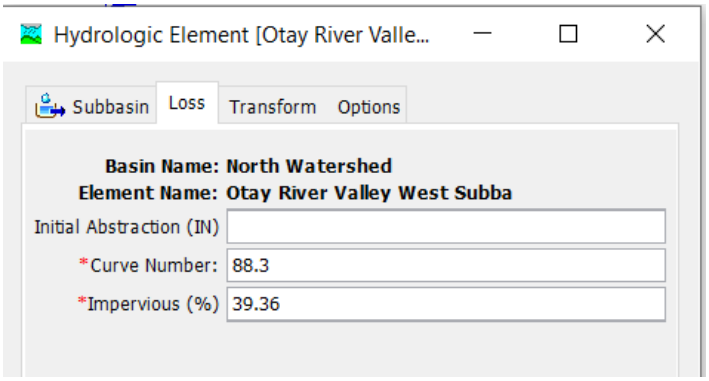
CURVE NUMBER =	83.4	PZN=2.0
Adjusted CN =	**88.3**	PZN=2.5

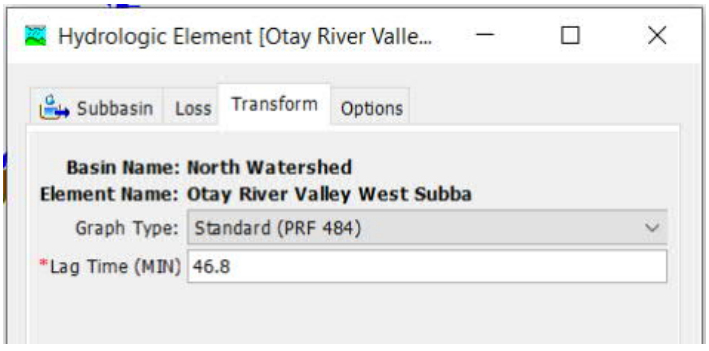
Average n	0.035			
m	0.38			
L	4.16	miles	21965	ft
Lc	2.08	miles	10982	ft
U/S Elev.	600	feet		
D/S Elev.	140	feet		
S	111	ft/mile	0.021	ft/ft

LAG TIME =	**0.780**	**hours**
	46.8	**min**

SOIL GROUP D ASSUMED


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Subba
Description:
Downstream: Existing Otay Valley Road
*Area (MI2) 4.911
Latitude Degrees:
Latitude Minutes:
Latitude Seconds:
Longitude Degrees:
Longitude Minutes:
Longitude Seconds:
Canopy Method: --None--
Surface Method: --None--
Loss Method: SCS Curve Number
Transform Method: SCS Unit Hydrograph
Baseflow Method: --None--


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Subba
Initial Abstraction (IN)
*Curve Number: 88.3
*Impervious (%) 39.36


Hydrologic Element [Otay River Valle...
Subbasin
Loss
Transform
Options
Basin Name: North Watershed
Element Name: Otay River Valley West Subba
Graph Type: Standard (PRF 484)
*Lag Time (MIN) 46.8

Global Summary Results for Run "100 Year 6 Hour"

Project: 0920_Village_8_East_Pr Simulation Run: 100 Year 6 Hour

Start of Run: 01Jan2011, 00:00
End of Run: 08Jan2011, 00:00
Compute Time: 03Jul2023, 17:29:37

Basin Model: North Watershed
Meteorologic Model: 100 Year 6 Hour
Control Specifications: 100 Year

Show Elements: All Elements | Volume Units: (•) IN ( ) ACRE-FT | Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Otay Lake Subbasin	96.910	22322.76	01Jan2011, 06:00	1.11
Otay Lake	96.910	6699.06	01Jan2011, 08:15	1.10
Savage Dam Spillwa...	96.910	6698.91	01Jan2011, 08:25	1.10
O'Neal Canyon Subb...	7.534	2523.08	01Jan2011, 05:00	1.08
Salt Creek Subbasin	5.216	2569.81	01Jan2011, 05:00	1.94
Otay River Junction	109.660	6800.40	01Jan2011, 08:15	1.14
Otay River Valley Ce...	109.660	6800.25	01Jan2011, 08:35	1.14
Otay River Valley Ce...	6.294	2724.27	01Jan2011, 04:55	1.51
Village 8 Outfall	115.954	7559.83	01Jan2011, 05:15	1.16
Otay River Valley W...	115.954	7601.97	01Jan2011, 05:35	1.16
Otay River Valley W...	4.911	2280.43	01Jan2011, 04:55	1.62
Existing Otay Valley ...	120.865	9111.08	01Jan2011, 05:30	1.18

Global Summary Results for Run "100 Year 24 Hour"

Project: 0920_Village_8_East_Pr Simulation Run: 100 Year 24 Hour

Start of Run: 01Jan2011, 00:00
End of Run: 08Jan2011, 00:00
Compute Time: 03Jul2023, 17:29:20

Basin Model: North Watershed
Meteorologic Model: 100 Year 24 Hour
Control Specifications: 100 Year

Show Elements: All Elements | Volume Units: (•) IN ( ) ACRE-FT | Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Otay Lake Subbasin	96.910	32860.72	01Jan2011, 17:50	3.66
Otay Lake	96.910	16958.13	01Jan2011, 19:55	3.66
Savage Dam Spillwa...	96.910	16958.47	01Jan2011, 20:00	3.66
O'Neal Canyon Subb...	7.534	3627.00	01Jan2011, 16:55	3.63
Salt Creek Subbasin	5.216	2770.29	01Jan2011, 17:00	4.73
Otay River Junction	109.660	18709.33	01Jan2011, 20:10	3.71
Otay River Valley Ce...	109.660	18710.28	01Jan2011, 20:25	3.71
Otay River Valley Ce...	6.294	3321.61	01Jan2011, 16:55	4.19
Village 8 Outfall	115.954	19625.37	01Jan2011, 20:30	3.73
Otay River Valley W...	115.954	19625.21	01Jan2011, 20:40	3.73
Otay River Valley W...	4.911	2687.46	01Jan2011, 16:50	4.33
Existing Otay Valley ...	120.865	20351.71	01Jan2011, 20:40	3.76

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 FX(858)558-1414

PRE-DEVELOPED CONDITION HYDROLOGY EXHIBIT
OTAY RIVER VALLEY HEC-HMS STUDY FOR

OTAY RANCH VILLAGE 8

CITY OF CHULA VISTA, CALIFORNIA

SHEET 1 OF 1

R:\ 4295-0004

R: \0920\Hyd\TM\DR\ACAD\0920 Otay River HMS Analysis Watershed Map.dwg[Apr-26-2023:12:31

PREPARED BY: HUNSAKER & ASSOCIATES SAN DIEGO, INC PLANNING 9707 Waples Street ENGINEERING San Diego, Ca 92121 SURVEYING PH(858)558-4500 FX(858)558-1414	DEVELOPED CONDITION HYDROLOGY EXHIBIT OTAY RIVER VALLEY HEC-HMS STUDY FOR OTAY RANCH VILLAGE 8 CITY OF CHULA VISTA, CALIFORNIA	SHEET 1 OF 1

R: \0920\Hyd\TM\DR\ACAD\0920 Otay River HMS Analysis Watershed Map.dwg[Apr-26-2023:12:31

APPENDIX B
HEC-RAS STUDY FOR 100-YEAR, 24-HOUR STORM EVENT WATER SURFACE ELEVATION AT THE VILLAGE 8 EAST OUTLET

CALCULATION OF VELOCITY AT OUTLET OF PROPOSED CONCRETE ENERGY DISSIPATOR (PRIOR TO RIP RAP DISSIPATION)

CALCULATION OF VELOCITY DOWNSTREAM OF RIP RAP

OTAY RANCH VILLAGE 8, EAST

Southwestern Outfall.

Eastern Outfall.

SOUTHWEST WATERSHED

EAST WATERSHED

FLOODPLAIN

FLOODWAY

FLOODWAY

FLOODPLAIN

OSP-2

OSP-2

sta 10+00

sta 10+50

sta 42+70

sta 43+30

SR-125

OTAY RIVER X-SECTION LOCATION FOR HEC-RAS ANALYSIS

OTAY RIVER X-SECTION LOCATION FOR HEC-RAS ANALYSIS

TOPOGRAPHY WAS COMILED USING PHOTOGRAMMETRIC METHOD
DATE OF PHOTOGRAPHY: 12/22/2021
CONTOUR INTERVAL: 1-ft

STA	EXISTING VEL	PROPOSED VEL	EXISTING WSE (FT.)	PROPOSED WSE (FT.)
10+00	6.15 F/S	6.27 CFS	180.91	180.91
10+50	5.43 F/S	6.34 CFS	181.3	181.3
42+70	6.20 F/S	5.44 CFS	198.43	198.43
43+30	5.70 F/S	7.33 CFS	198.92	198.92

0 250 500 750

SCALE 1"=250'

EXHIBIT APPENDIX B
HEC RAS - CROSS SECTION LOCATION

OTAY RANCH VILLAGE 8 EAST

W.O.# 2825-0003

R:\0920\Hyd\TM\DR\ACAD\920$H01-HYDRO Exhibit HEC-RAS PR-V8 TM.dwg[]Sep-15-2023:14:27

Justification for the Manning's N values in the pre- and post-condition analysis.

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 2 OF 12

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
CARLSBAD, CITY OF	060285	NATIONAL CITY, CITY OF	060293
CHULA VISTA, CITY OF	065021	OCEANSIDE, CITY OF	060294
CORONADO, CITY OF	060287	POWAY, CITY OF	060702
DEL MAR, CITY OF	060288	SAN DIEGO, CITY OF	060295
EL CAJON, CITY OF	060289	SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284
ENCINITAS, CITY OF	060726	SAN MARCOS, CITY OF	060296
ESCONDIDO, CITY OF	060290	SANTEE, CITY OF	060703
IMPERIAL BEACH, CITY OF	060291	SOLANA BEACH, CITY OF	060725
LA MESA, CITY OF	060292	VISTA, CITY OF	060297
LEMON GROVE, CITY OF	060723		

REVISED: March 22, 2022

FLOOD INSURANCE STUDY NUMBER
06073CV002F
Version Number 2.4.3.0

FEMA

Table 13: Roughness Coefficients, continued

Flooding Source	Channel “n”	Overbank “n”
Loma Alta Creek	0.018-0.070	0.035-0.045
Los Penasquitos Creek	0.030-0.060	0.020-0.080
Lusardi Creek	*	*
Mexican Canyon Creek	0.025-0.040	0.030-0.050
Moosa Creek (North Branch)	*	*
Moosa Creek (South Branch)	*	*
Murphy Canyon Creek	0.015-0.035	0.030-0.040
Murray Canyon Creek	0.020-0.050	0.080
Nestor Creek	0.030-0.045	0.030-0.100
North Branch Poway Creek	0.014-0.035	0.018-0.035
North Tributary to Santa Maria Creek	0.015-0.090	0.015-0.060
Olive Creek	*	*
Otay River	0.040	0.040
Pala Mesa Golf Course	*	*
Paradise Creek	0.016-0.030	0.018
Poggi Canyon Creek	0.013-0.050	0.050-0.040
Poway Creek	0.014-0.050	0.018-0.040
Rainbow Creek (Main Branch)	*	*
Rainbow Creek (West Branch)	*	*
Rattlesnake Creek	0.014-0.040	0.010-0.060
Rattlesnake Creek Split Flow at Heritage Hills	0.014-0.040	0.010-0.060
Rattlesnake Creek Split Flow at Midland Road	0.014-0.040	0.010-0.060
Reidy Creek	0.014-0.040	0.010-0.060
Rice Canyon Creek	0.013	0.013
Rose Canyon Creek	0.040	0.035-0.040
Samagutuma Creek	0.035-0.040	0.030-0.040
San Clemente Canyon Creek	0.035-0.040	0.015-0.040
San Diego River	0.025-0.125	0.030-0.125
San Dieguito River	0.030-0.035	0.030-0.045
San Elijo Creek	*	*

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Otay River at Village 8 Outlet
Project File : village8exist.prj
Run Date and Time: 9/15/2023 2:39:10 PM

Project in English units

Project Description:
OR Village 8 HEC RAS Analysis at storm drain outlet.
Existing Conditions

PLAN DATA

Plan Title: Plan 03
Plan File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Exist\village8exist.p03

Geometry Title: Geom 01
Geometry File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Exist\village8exist.g01

Flow Title : Flow 01
Flow File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Exist\village8exist.f01

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Flow 01
Flow File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Exist\village8exist.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Otay River	1	4330	19619.13

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Otay River	1	PF 1	Normal S = 0.006	Normal S = 0.006

GEOMETRY DATA

Geometry Title: Geom 01
Geometry File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Exist\village8exist.g01

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 4330

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	220	32	219	58.23	218	86.27	217	122.1	216
152.96	215	180.6	214	184.7	213	192	212.5	198.1	212.9
204.397	211	210	210	235.9	206	253.4	205	263.9	200
274.17	197	283.556	196	305.487	195	321.351	195	392	196
447.2	197	486.2	197	505.396	195	507.2	194.11	537.16	194.11
541.859	195	541.859	197	548.33	197	592.166	196.22	642.274	198
693.024	198	727.022	198	801.938	197	826.53	196	838.17	195
853.36	194	867.24	193	982.19	193	1094.44	198	1103	199
1130	199	1164.67	196	1166.67	195.2	1236	195.2	1238.45	196
1395	196	1444	197	1449	200	1469.52	205	1492.3	206
1601	219.384	1606	220						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	180.6	.04	1601	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
180.6	1601	62.36	60	67	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	199.42	Element			
Vel Head (ft)	0.50	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.92	Reach Len. (ft)	62.36	60.00	67.00
Crit W.S. (ft)	197.94	Flow Area (sq ft)		3444.03	
E.G. Slope (ft/ft)	0.005479	Area (sq ft)		3444.03	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1150.99	Top Width (ft)		1150.99	
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		5.70	
Max Chl Dpth (ft)	5.92	Hydr. Depth (ft)		2.99	
Conv. Total (cfs)	265041.4	Conv. (cfs)		265041.4	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		1155.05	
Min Ch El (ft)	193.00	Shear (lb/sq ft)		1.02	
Alpha	1.00	Stream Power (lb/ft s)		5.81	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)		259.00	
C & E Loss (ft)	0.01	Cum SA (acres)		84.52	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 4270

INPUT
Description:
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	220	137.77	215	180.25	210	208	205	222.3	203
232	200	258.07	195	296.54	195	360.96	196	462.9	196
469.2	195	472.32	194.11	484.7	194.11	486.2	195	490	196
496.23	197	521.3	197	569	197	678	195	680	194.5
916	194.5	918.4	195	947.3	196	1021	196	1034	194.5
1046	196	1100.7	196	1154	196	1273.83	196.6	1322.56	197
1339.326	197	1355.9	196	1382.5	196	1418.27	197	1429	200
1439	205	1552	219.584	1552.9	219.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	0	.04	1552	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	1552	2887	3220	3475	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	199.03	Element			
Vel Head (ft)	0.60	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.43	Reach Len. (ft)	2887.00	3220.00	3475.00
Crit W.S. (ft)		Flow Area (sq ft)		3162.92	
E.G. Slope (ft/ft)	0.007529	Area (sq ft)		3162.92	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1183.23	Top Width (ft)		1183.23	
Vel Total (ft/s)	6.20	Avg. Vel. (ft/s)		6.20	
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.67	
Conv. Total (cfs)	226110.4	Conv. (cfs)		226110.4	
Length Wtd. (ft)	3220.00	Wetted Per. (ft)		1184.80	
Min Ch El (ft)	194.11	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		7.78	
Frctn Loss (ft)	17.23	Cum Volume (acre-ft)		254.45	
C & E Loss (ft)	0.04	Cum SA (acres)		82.91	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 1050

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200	11.8	195	20.5	190	27.03	188	33.83	187.5
40	188	41.65	188	44.25	187	48.8	185	53.61	183
58.55	182	81.1	182	130.14	182	140.12	180	152.16	178
200.25	178	349.8	178	362.4	177.9	385.4	178	411	178
461	178	500.5	177	540.6	177	728.8	177	820.83	178
834.9	178	884.9	178	996	178	1064.6	177.14	1087.15	177.14
1101.7	180	1131.77	180	1140.3	178	1142.2	177.17	1159.2	180
1171.72	186	1215	189.492	1221.3	190	1240.3	195	1251	199.115

1252 199.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	0	.04	1251	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	1251	51	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	181.76	Element			
Vel Head (ft)	0.46	Wt. n-Val.		0.040	
W.S. Elev (ft)	181.30	Reach Len. (ft)	51.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		3615.68	
E.G. Slope (ft/ft)	0.003998	Area (sq ft)		3615.68	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1028.28	Top Width (ft)		1028.28	
Vel Total (ft/s)	5.43	Avg. Vel. (ft/s)		5.43	
Max Chl Dpth (ft)	4.30	Hydr. Depth (ft)		3.52	
Conv. Total (cfs)	310275.2	Conv. (cfs)		310275.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		1029.81	
Min Ch El (ft)	177.00	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		4.76	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)		3.90	
C & E Loss (ft)	0.01	Cum SA (acres)		1.18	

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 1000

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200	12	195	22.12	190	25	188	31.63	187.4
37.72	188	48.04	185	55.26	183	59.1	182	79.1	182
131.37	182	139.2	180	151.2	178	339.85	178	357.4	177.9
378.38	178	442.45	178	474.5	177	520.55	176.6	564.2	177
596.61	177	751.79	178	832.87	178	844.87	178	877	179
951	180	970	177.14	1146.18	177.14	1159.41	183	1174.2	185
1208	186.7	1262	200						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	0	.04	1262	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	1262	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	181.50	Element			
Vel Head (ft)	0.59	Wt. n-Val.		0.040	
W.S. Elev (ft)	180.91	Reach Len. (ft)			
Crit W.S. (ft)	180.03	Flow Area (sq ft)		3188.01	
E.G. Slope (ft/ft)	0.006009	Area (sq ft)		3188.01	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1019.07	Top Width (ft)		1019.07	
Vel Total (ft/s)	6.15	Avg. Vel. (ft/s)		6.15	
Max Chl Dpth (ft)	4.31	Hydr. Depth (ft)		3.13	
Conv. Total (cfs)	253095.6	Conv. (cfs)		253095.6	
Length Wtd. (ft)		Wetted Per. (ft)		1020.41	
Min Ch El (ft)	176.60	Shear (lb/sq ft)		1.17	
Alpha	1.00	Stream Power (lb/ft s)		7.21	
Frctn Loss (ft)		Cum Volume (acre-ft)			

C & E Loss (ft) Cum SA (acres)

SUMMARY OF MANNING'S N VALUES

River:Otay River

Reach	River Sta.	n1	n2	n3
1	4330	.04	.04	.04
1	4270	.04	.04	.04
1	1050	.04	.04	.04
1	1000	.04	.04	.04

SUMMARY OF REACH LENGTHS

River: Otay River

Reach	River Sta.	Left	Channel	Right
1	4330	62.36	60	67
1	4270	2887	3220	3475
1	1050	51	50	50
1	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Otay River

Reach	River Sta.	Contr.	Expan.
1	4330	.1	.3
1	4270	.1	.3
1	1050	.1	.3
1	1000	.1	.3

VILLAGE 8 EAST EXISTING CONDITIONS

HEC-RAS Plan: Plan 03 River: Otay River Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1000	PF 1	19619.13	176.60	180.91	180.03	181.50	0.006009	6.15	3188.01	1019.07	0.61
1	1050	PF 1	19619.13	177.00	181.30		181.76	0.003998	5.43	3615.68	1028.28	0.51
1	4270	PF 1	19619.13	194.11	198.43		199.03	0.007529	6.20	3162.92	1183.23	0.67
1	4330	PF 1	19619.13	193.00	198.92	197.94	199.42	0.005479	5.70	3444.03	1150.99	0.58

Plan: Plan 03 Otay River 1 RS: 4330 Profile: PF 1

E.G. Elev (ft)	199.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.92	Reach Len. (ft)	62.36	60.00	67.00
Crit W.S. (ft)	197.94	Flow Area (sq ft)		3444.03	
E.G. Slope (ft/ft)	0.005479	Area (sq ft)		3444.03	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1150.99	Top Width (ft)		1150.99	
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		5.70	
Max Chl Dpth (ft)	5.92	Hydr. Depth (ft)		2.99	
Conv. Total (cfs)	265041.4	Conv. (cfs)		265041.4	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		1155.05	
Min Ch El (ft)	193.00	Shear (lb/sq ft)		1.02	
Alpha	1.00	Stream Power (lb/ft s)		5.81	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)		259.00	
C & E Loss (ft)	0.01	Cum SA (acres)		84.52	

Plan: Plan 03 Otay River 1 RS: 4270 Profile: PF 1

E.G. Elev (ft)	199.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.43	Reach Len. (ft)	2887.00	3220.00	3475.00
Crit W.S. (ft)		Flow Area (sq ft)		3162.92	
E.G. Slope (ft/ft)	0.007529	Area (sq ft)		3162.92	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1183.23	Top Width (ft)		1183.23	
Vel Total (ft/s)	6.20	Avg. Vel. (ft/s)		6.20	
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.67	
Conv. Total (cfs)	226110.4	Conv. (cfs)		226110.4	
Length Wtd. (ft)	3220.00	Wetted Per. (ft)		1184.80	
Min Ch El (ft)	194.11	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		7.78	
Frctn Loss (ft)	17.23	Cum Volume (acre-ft)		254.45	
C & E Loss (ft)	0.04	Cum SA (acres)		82.91	

Plan: Plan 03 Otay River 1 RS: 1050 Profile: PF 1

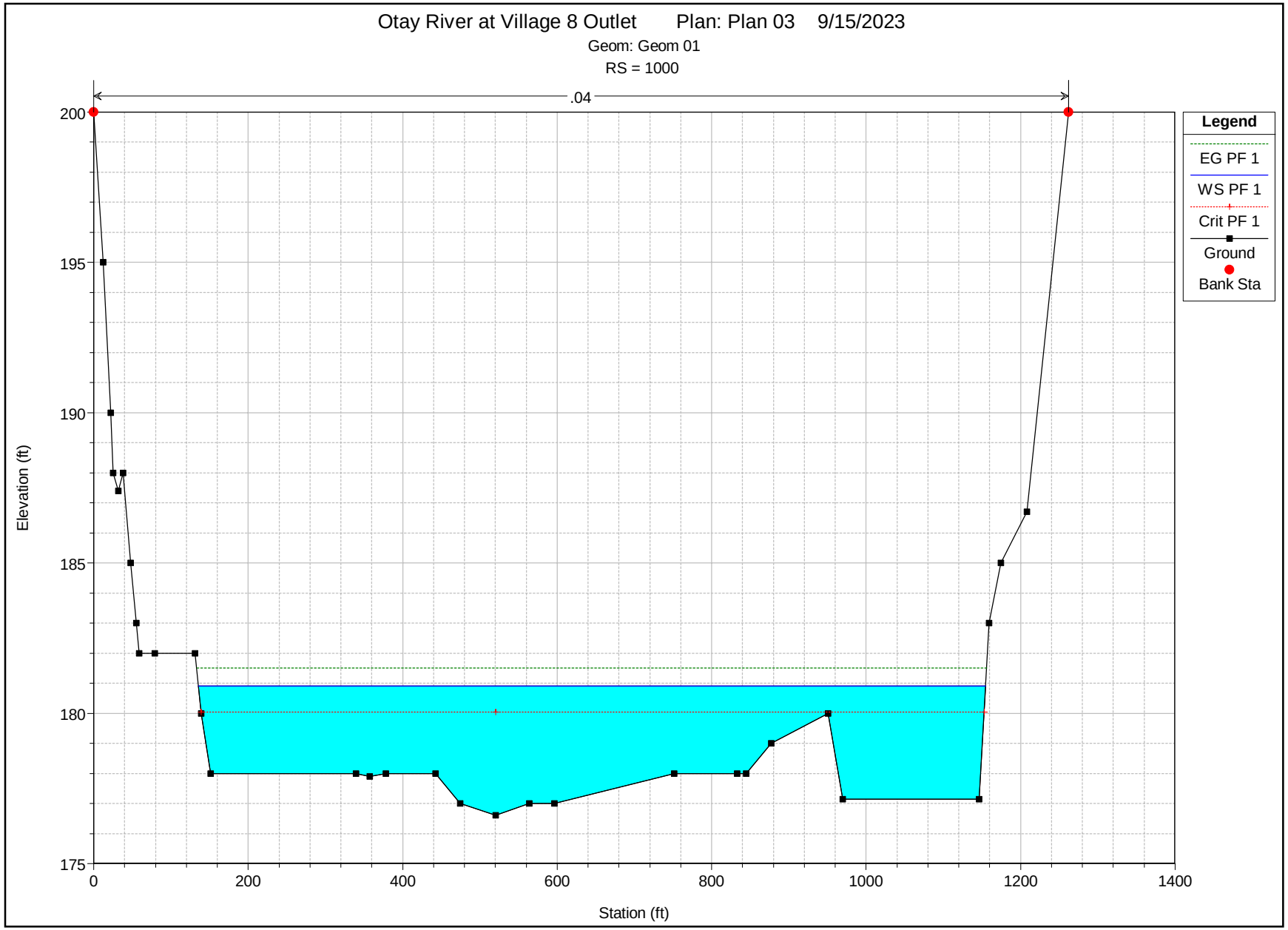
E.G. Elev (ft)	181.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.		0.040	
W.S. Elev (ft)	181.30	Reach Len. (ft)	51.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		3615.68	

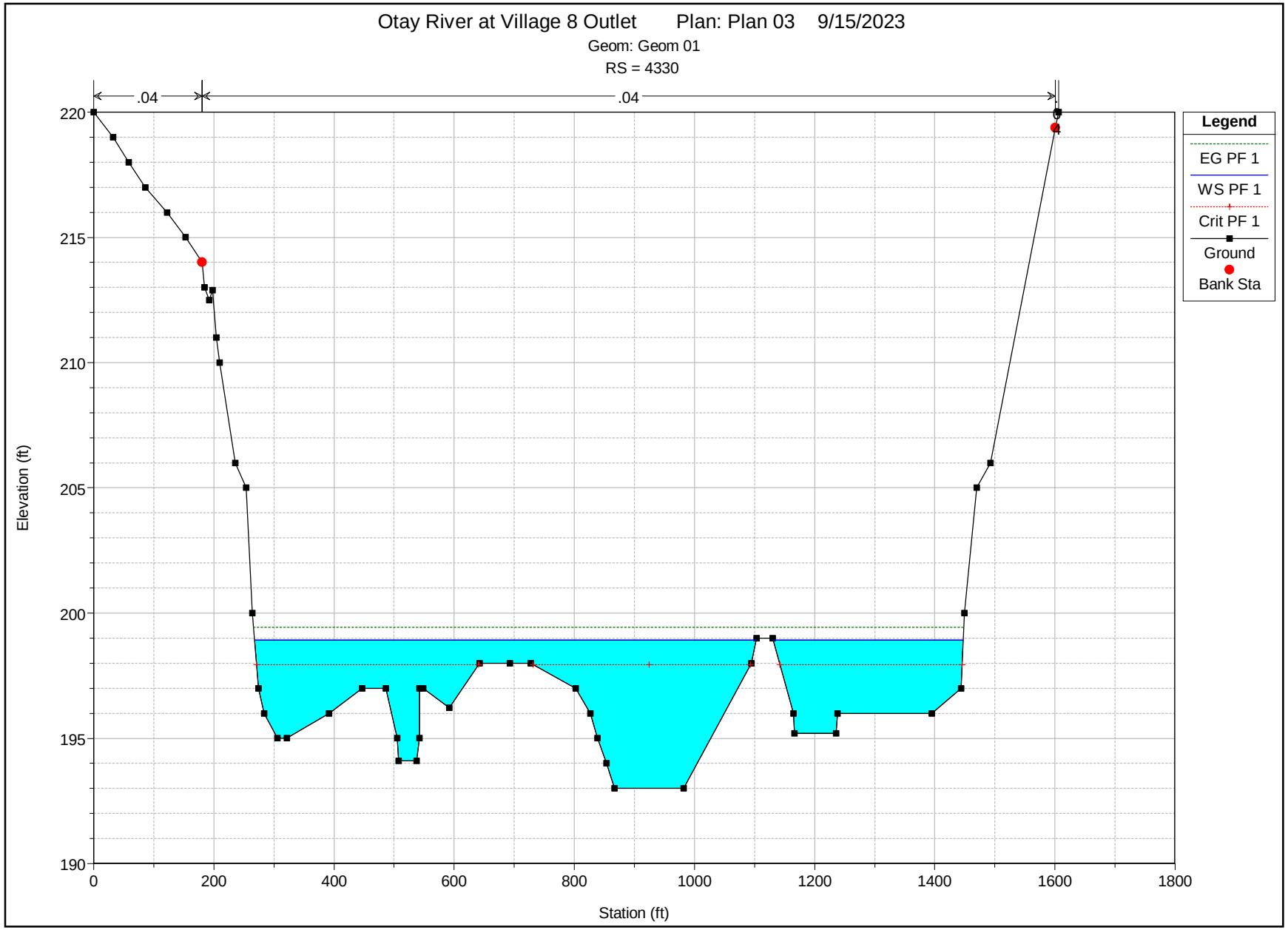
Plan: Plan 03 Otay River 1 RS: 1050 Profile: PF 1 (Continued)

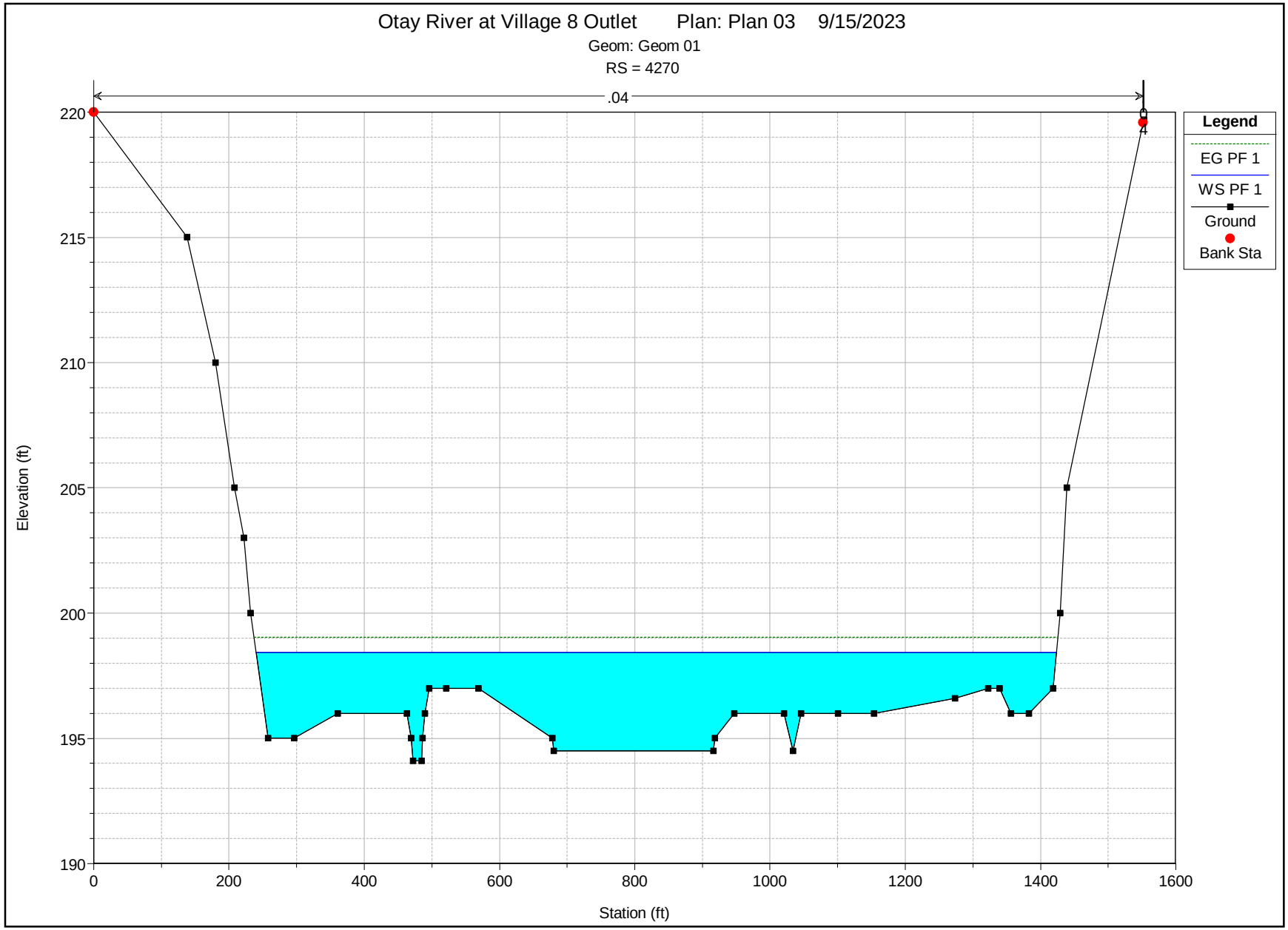
E.G. Slope (ft/ft)	0.003998	Area (sq ft)		3615.68	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1028.28	Top Width (ft)		1028.28	
Vel Total (ft/s)	5.43	Avg. Vel. (ft/s)		5.43	
Max Chl Dpth (ft)	4.30	Hydr. Depth (ft)		3.52	
Conv. Total (cfs)	310275.2	Conv. (cfs)		310275.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		1029.81	
Min Ch El (ft)	177.00	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		4.76	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)		3.90	
C & E Loss (ft)	0.01	Cum SA (acres)		1.18	

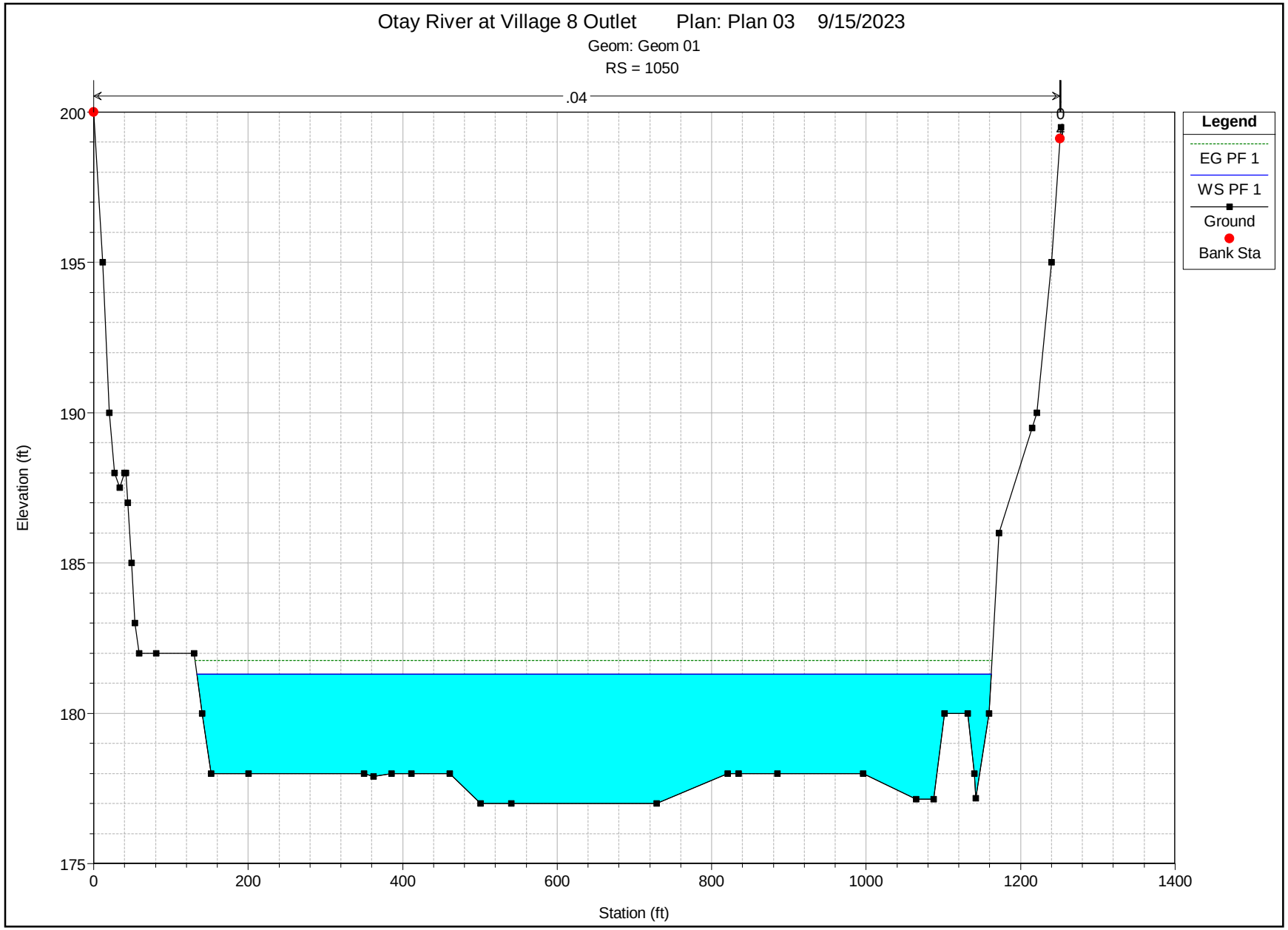
Plan: Plan 03 Otay River 1 RS: 1000 Profile: PF 1

E.G. Elev (ft)	181.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.		0.040	
W.S. Elev (ft)	180.91	Reach Len. (ft)			
Crit W.S. (ft)	180.03	Flow Area (sq ft)		3188.01	
E.G. Slope (ft/ft)	0.006009	Area (sq ft)		3188.01	
Q Total (cfs)	19619.13	Flow (cfs)		19619.13	
Top Width (ft)	1019.07	Top Width (ft)		1019.07	
Vel Total (ft/s)	6.15	Avg. Vel. (ft/s)		6.15	
Max Chl Dpth (ft)	4.31	Hydr. Depth (ft)		3.13	
Conv. Total (cfs)	253095.6	Conv. (cfs)		253095.6	
Length Wtd. (ft)		Wetted Per. (ft)		1020.41	
Min Ch El (ft)	176.60	Shear (lb/sq ft)		1.17	
Alpha	1.00	Stream Power (lb/ft s)		7.21	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 1000
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
200
195
190
185
180
175
0
200
400
600
800
1000
1200
1400


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 4330
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
215
210
205
200
195
190
0
200
400
600
800
1000
1200
1400
1600
1800


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 4270
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
215
210
205
200
195
190
0
200
400
600
800
1000
1200
1400
1600


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 1050
.04
0
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
200
195
190
185
180
175
0
200
400
600
800
1000
1200
1400

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
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PROJECT DATA
Project Title: Otay River at Village 8 Outlet
Project File : village8PR (1).prj
Run Date and Time: 9/15/2023 2:19:47 PM

Project in English units

Project Description:
OR Village 8 HEC RAS Analysis at storm drain outlet.
Proposed Conditions

PLAN DATA

Plan Title: Plan 03
Plan File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Proposed\village8PR (1).p03

Geometry Title: Geom 01
Geometry File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Proposed\village8PR (1).g01

Flow Title : Flow 01
Flow File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Proposed\village8PR (1).f01

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Flow 01
Flow File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Proposed\village8PR (1).f01

Flow Data (cfs)

River	Reach	RS	PF 1
Otay River	1	4330	19625.37

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Otay River	1	PF 1	Normal S = 0.006	Normal S = 0.006

GEOMETRY DATA

Geometry Title: Geom 01
Geometry File : r:\0920\Hyd\TM\DR\Calcs\HEC-RAS\V8 Proposed\village8PR (1).g01

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 4330

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	220	32	219	58.23	218	86.27	217	122.1	216
152.96	215	180.6	214	184.7	213	192	212.5	198.1	212.9
204.397	211	210	210	235.9	206	253.4	205	263.9	200
274.17	197	283.556	196	305.487	195	321.351	195	392	196
447.2	197	486.2	197	505.396	195	507.2	194.11	537.16	194.11
541.859	195	541.859	197	548.33	197	592.166	196.22	642.274	198
693.024	198	727.022	198	801.938	197	826.53	196	838.17	195
853.36	194	867.24	193	982.19	193	1094.44	198	1103	199
1130	199	1164.67	196	1166.67	195.2	1236	195.2	1238.45	196
1395	196	1444	197	1449	200	1469.52	205	1492.3	206
1601	219.384	1606	220						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	180.6	.04	1601	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
180.6	1601	62.36	60	67	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	199.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.92	Reach Len. (ft)	62.36	60.00	67.00
Crit W.S. (ft)	197.94	Flow Area (sq ft)		3444.66	
E.G. Slope (ft/ft)	0.005480	Area (sq ft)		3444.66	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1151.01	Top Width (ft)		1151.01	
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		5.70	
Max Chl Dpth (ft)	5.92	Hydr. Depth (ft)		2.99	
Conv. Total (cfs)	265120.3	Conv. (cfs)		265120.3	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		1155.06	
Min Ch El (ft)	193.00	Shear (lb/sq ft)		1.02	
Alpha	1.00	Stream Power (lb/ft s)		5.81	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)		259.05	
C & E Loss (ft)	0.01	Cum SA (acres)		84.52	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 4270

INPUT
Description:
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	220	137.77	215	180.25	210	208	205	222.3	203
232	200	258.07	195	296.54	195	360.96	196	462.9	196
469.2	195	472.32	194.11	484.7	194.11	486.2	195	490	196
496.23	197	521.3	197	569	197	678	195	680	194.5
916	194.5	918.4	195	947.3	196	1021	196	1034	194.5
1046	196	1100.7	196	1154	196	1273.83	196.6	1322.56	197
1339.326	197	1355.9	196	1382.5	196	1418.27	197	1429	200
1439	205	1552	219.584	1552.9	219.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	0	.04	1552	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	1552	2887	3220	3475	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	199.03	Element			
Vel Head (ft)	0.60	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.43	Reach Len. (ft)	2887.00	3220.00	3475.00
Crit W.S. (ft)		Flow Area (sq ft)		3163.57	
E.G. Slope (ft/ft)	0.007528	Area (sq ft)		3163.57	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1183.24	Top Width (ft)		1183.24	
Vel Total (ft/s)	6.20	Avg. Vel. (ft/s)		6.20	
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.67	
Conv. Total (cfs)	226187.1	Conv. (cfs)		226187.1	
Length Wtd. (ft)	3220.00	Wetted Per. (ft)		1184.80	
Min Ch El (ft)	194.11	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		7.79	
Frctn Loss (ft)	17.23	Cum Volume (acre-ft)		254.49	
C & E Loss (ft)	0.04	Cum SA (acres)		82.91	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 1050

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200	11.8	195	20.5	190	27.03	188	33.83	187.5
40	188	41.65	188	44.25	187	48.8	185	53.61	183
58.55	182	81.1	182	130.14	182	140.12	180	152.16	178
200.25	178	349.8	178	362.4	177.9	385.4	178	411	178
461	178	500.5	177	540.6	177	728.8	177	820.83	178
834.9	178	884.9	178	996	178	1064.6	177.14	1087.15	177.14
1101.7	180	1131.77	180	1140.3	178	1142.2	177.17	1159.2	180
1171.72	186	1215	189.492	1221.3	190	1240.3	195	1251	199.115

1252 199.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	0	.04	1251	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	1251	51	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	181.76	Element			
Vel Head (ft)	0.46	Wt. n-Val.		0.040	
W.S. Elev (ft)	181.30	Reach Len. (ft)	51.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		3616.34	
E.G. Slope (ft/ft)	0.003998	Area (sq ft)		3616.34	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1028.29	Top Width (ft)		1028.29	
Vel Total (ft/s)	5.43	Avg. Vel. (ft/s)		5.43	
Max Chl Dpth (ft)	4.30	Hydr. Depth (ft)		3.52	
Conv. Total (cfs)	310368.4	Conv. (cfs)		310368.4	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		1029.82	
Min Ch El (ft)	177.00	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		4.76	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)		3.91	
C & E Loss (ft)	0.01	Cum SA (acres)		1.18	

CROSS SECTION

RIVER: Otay River
REACH: 1 RS: 1000

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200	12	195	22.12	190	25	188	31.63	187.4
37.72	188	48.04	185	55.26	183	59.1	182	79.1	182
131.37	182	139.2	180	151.2	178	339.85	178	357.4	177.9
378.38	178	442.45	178	474.5	177	520.55	176.6	564.2	177
596.61	177	751.79	178	832.87	178	844.87	178	877	179
951	180	970	177.14	1146.18	177.14	1159.41	183	1174.2	185
1208	186.7	1262	200						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	0	.04	1262	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
0	1262	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	181.50	Element			
Vel Head (ft)	0.59	Wt. n-Val.		0.040	
W.S. Elev (ft)	180.91	Reach Len. (ft)			
Crit W.S. (ft)	180.04	Flow Area (sq ft)		3188.63	
E.G. Slope (ft/ft)	0.006009	Area (sq ft)		3188.63	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1019.08	Top Width (ft)		1019.08	
Vel Total (ft/s)	6.15	Avg. Vel. (ft/s)		6.15	
Max Chl Dpth (ft)	4.31	Hydr. Depth (ft)		3.13	
Conv. Total (cfs)	253177.3	Conv. (cfs)		253177.3	
Length Wtd. (ft)		Wetted Per. (ft)		1020.41	
Min Ch El (ft)	176.60	Shear (lb/sq ft)		1.17	
Alpha	1.00	Stream Power (lb/ft s)		7.21	
Frctn Loss (ft)		Cum Volume (acre-ft)			

C & E Loss (ft) Cum SA (acres)

SUMMARY OF MANNING'S N VALUES

River:Otay River

Reach	River Sta.	n1	n2	n3
1	4330	.04	.04	.04
1	4270	.04	.04	.04
1	1050	.04	.04	.04
1	1000	.04	.04	.04

SUMMARY OF REACH LENGTHS

River: Otay River

Reach	River Sta.	Left	Channel	Right
1	4330	62.36	60	67
1	4270	2887	3220	3475
1	1050	51	50	50
1	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Otay River

Reach	River Sta.	Contr.	Expan.
1	4330	.1	.3
1	4270	.1	.3
1	1050	.1	.3
1	1000	.1	.3

VILLAGE 8 EAST PROPOSED CONDITIONS

HEC-RAS Plan: Plan 03 River: Otay River Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1000	PF 1	19625.37	176.60	180.91	180.04	181.50	0.006009	6.15	3188.63	1019.08	0.61
1	1050	PF 1	19625.37	177.00	181.30		181.76	0.003998	5.43	3616.34	1028.29	0.51
1	4270	PF 1	19625.37	194.11	198.43		199.03	0.007528	6.20	3163.57	1183.24	0.67
1	4330	PF 1	19625.37	193.00	198.92	197.94	199.43	0.005480	5.70	3444.66	1151.01	0.58

Plan: Plan 03 Otay River 1 RS: 4330 Profile: PF 1

E.G. Elev (ft)	199.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.92	Reach Len. (ft)	62.36	60.00	67.00
Crit W.S. (ft)	197.94	Flow Area (sq ft)		3444.66	
E.G. Slope (ft/ft)	0.005480	Area (sq ft)		3444.66	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1151.01	Top Width (ft)		1151.01	
Vel Total (ft/s)	5.70	Avg. Vel. (ft/s)		5.70	
Max Chl Dpth (ft)	5.92	Hydr. Depth (ft)		2.99	
Conv. Total (cfs)	265120.3	Conv. (cfs)		265120.3	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		1155.06	
Min Ch El (ft)	193.00	Shear (lb/sq ft)		1.02	
Alpha	1.00	Stream Power (lb/ft s)		5.81	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)		259.05	
C & E Loss (ft)	0.01	Cum SA (acres)		84.52	

Plan: Plan 03 Otay River 1 RS: 4270 Profile: PF 1

E.G. Elev (ft)	199.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.040	
W.S. Elev (ft)	198.43	Reach Len. (ft)	2887.00	3220.00	3475.00
Crit W.S. (ft)		Flow Area (sq ft)		3163.57	
E.G. Slope (ft/ft)	0.007528	Area (sq ft)		3163.57	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1183.24	Top Width (ft)		1183.24	
Vel Total (ft/s)	6.20	Avg. Vel. (ft/s)		6.20	
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		2.67	
Conv. Total (cfs)	226187.1	Conv. (cfs)		226187.1	
Length Wtd. (ft)	3220.00	Wetted Per. (ft)		1184.80	
Min Ch El (ft)	194.11	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		7.79	
Frctn Loss (ft)	17.23	Cum Volume (acre-ft)		254.49	
C & E Loss (ft)	0.04	Cum SA (acres)		82.91	

Plan: Plan 03 Otay River 1 RS: 1050 Profile: PF 1

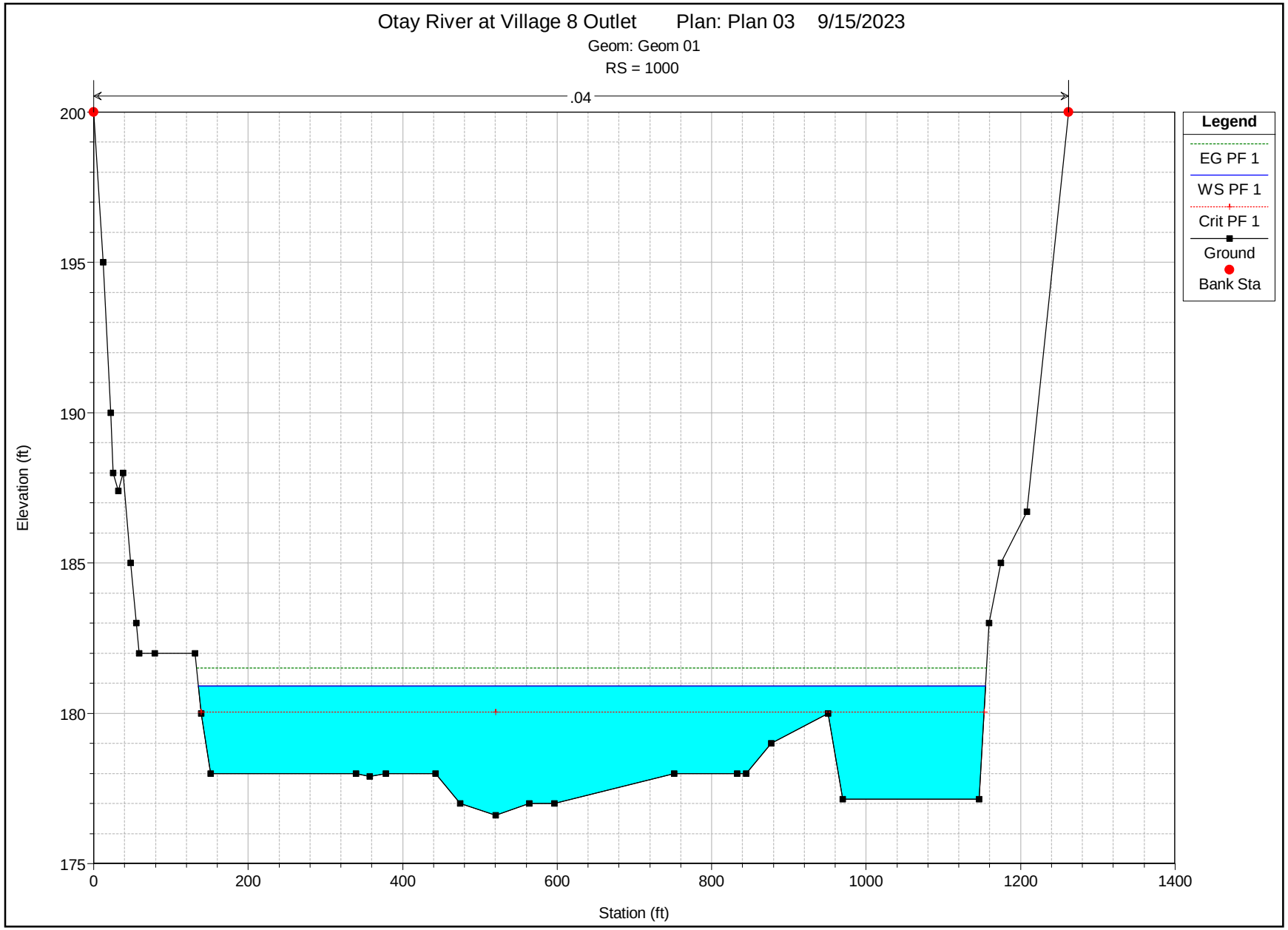
E.G. Elev (ft)	181.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.		0.040	
W.S. Elev (ft)	181.30	Reach Len. (ft)	51.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		3616.34	

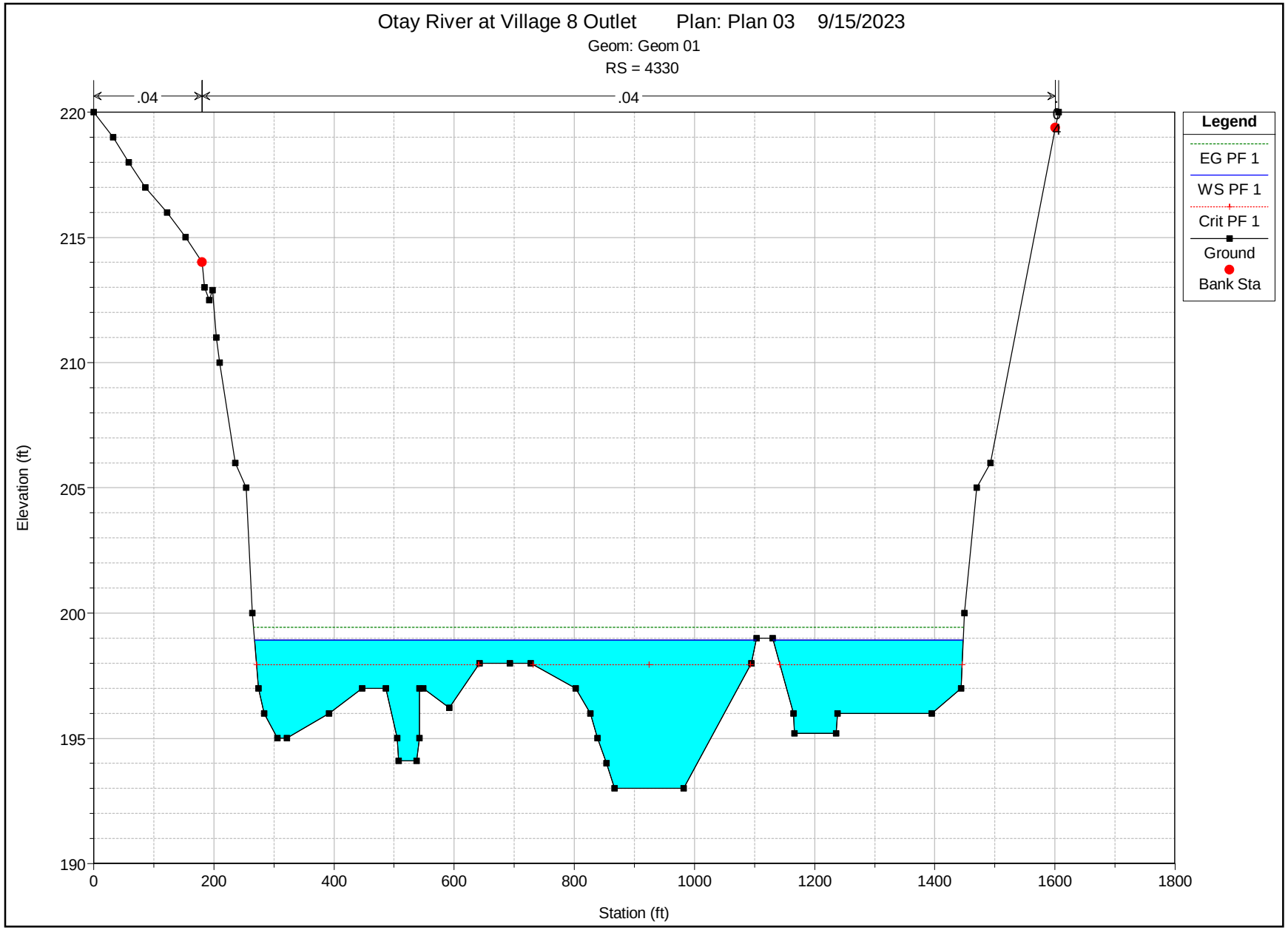
Plan: Plan 03 Otay River 1 RS: 1050 Profile: PF 1 (Continued)

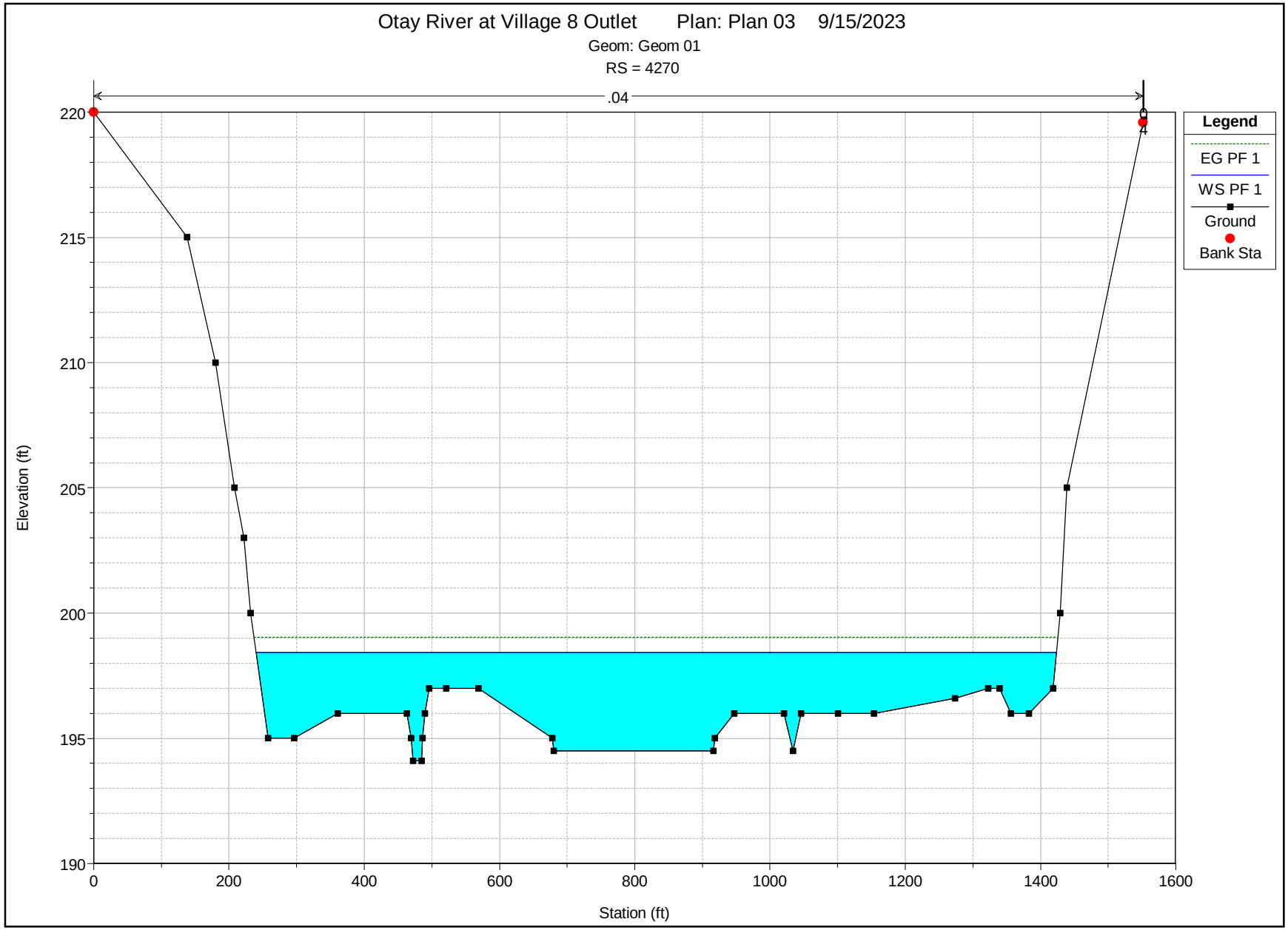
E.G. Slope (ft/ft)	0.003998	Area (sq ft)		3616.34	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1028.29	Top Width (ft)		1028.29	
Vel Total (ft/s)	5.43	Avg. Vel. (ft/s)		5.43	
Max Chl Dpth (ft)	4.30	Hydr. Depth (ft)		3.52	
Conv. Total (cfs)	310368.4	Conv. (cfs)		310368.4	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		1029.82	
Min Ch El (ft)	177.00	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		4.76	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)		3.91	
C & E Loss (ft)	0.01	Cum SA (acres)		1.18	

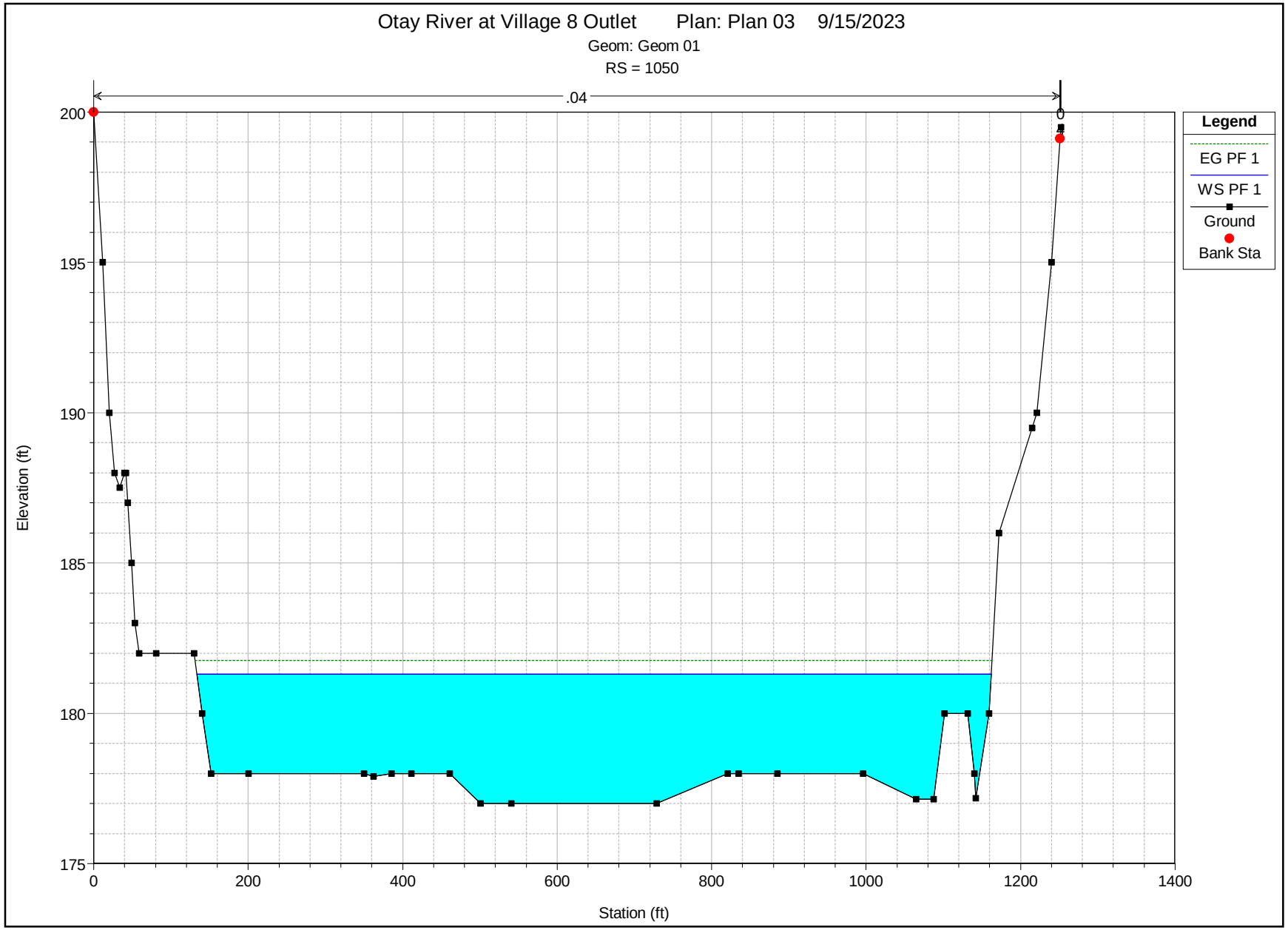
Plan: Plan 03 Otay River 1 RS: 1000 Profile: PF 1

E.G. Elev (ft)	181.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.		0.040	
W.S. Elev (ft)	180.91	Reach Len. (ft)			
Crit W.S. (ft)	180.04	Flow Area (sq ft)		3188.63	
E.G. Slope (ft/ft)	0.006009	Area (sq ft)		3188.63	
Q Total (cfs)	19625.37	Flow (cfs)		19625.37	
Top Width (ft)	1019.08	Top Width (ft)		1019.08	
Vel Total (ft/s)	6.15	Avg. Vel. (ft/s)		6.15	
Max Chl Dpth (ft)	4.31	Hydr. Depth (ft)		3.13	
Conv. Total (cfs)	253177.3	Conv. (cfs)		253177.3	
Length Wtd. (ft)		Wetted Per. (ft)		1020.41	
Min Ch El (ft)	176.60	Shear (lb/sq ft)		1.17	
Alpha	1.00	Stream Power (lb/ft s)		7.21	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 1000
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
200
195
190
185
180
175
0
200
400
600
800
1000
1200
1400


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 4330
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
215
210
205
200
195
190
0
200
400
600
800
1000
1200
1400
1600
1800


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 4270
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
215
210
205
200
195
190
0
200
400
600
800
1000
1200
1400
1600


Otay River at Village 8 Outlet Plan: Plan 03 9/15/2023
Geom: Geom 01
RS = 1050
.04
0
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
200
195
190
185
180
175
0
200
400
600
800
1000
1200
1400

APPENDIX C
GEOLOGIC MAPS AND SUBDRAIN OUTLET HEADWALL DETAIL

OTAY RANCH VILLAGE 8

IMPACT BASIN AT OTAY RIVER - EAST OUTLET (78" RCP)

ENERGY DISSIPATOR - IMPACT BASIN CALCULATIONS

(APWA Standard Plan 384-1)

Given :

$Q = 774.35$ cfs
$d = 78$ " RCP
$W_w = 62.4$ pcf
$H_v = v^2/(2g)$

Then :

$A = 33.18$ sq. ft.
$v = 23.34$ fps
$H_v = 8.456$ ft.

for full pipe flow

$IMPACT = H_v \times W_w$
$= 527.6$ psf < 600 psf for W= 14 feet; OK

Therefore:

Use basin width, W = 14 feet
length of riprap = 4 x d = 26.0 feet

Size riprap based on velocity over end sill:

weir eqn: $Q = CLH^{1.5}$; C = 3.3 per Table 5-3 of King's Handbook

$H = (Q/CL)^{2/3}$
$H = 6.549$ feet

Then :

$A = 92$ sq. ft.
$v = 8.445$ fps

See riprap sizing spreadsheet for sizing based upon this velocity.

OTAY RANCH VILLAGE 8

IMPACT BASIN AT OTAY RIVER - WEST OUTLET (60" RCP)

ENERGY DISSIPATOR - IMPACT BASIN CALCULATIONS

(APWA Standard Plan 384-1)

Given :

Q = 401 cfs
d = 60 " RCP
W_w = 62.4 pcf
H_v = $v^2/(2g)$

Then :

A = 19.6 sq. ft.
v = 20.4 fps | for full pipe flow
H_v = 6.46 ft.

IMPACT = $H_v \times W_w$
= 403 psf < 450 psf for W= 10 feet; OK

Therefore:

Use basin width, W = 10 feet
length of riprap = 4 x d = 20.00 feet

these values are preliminary estimates. Design of this outlet location is begin designed with Village 8 West by others.

Size riprap based on velocity over end sill:

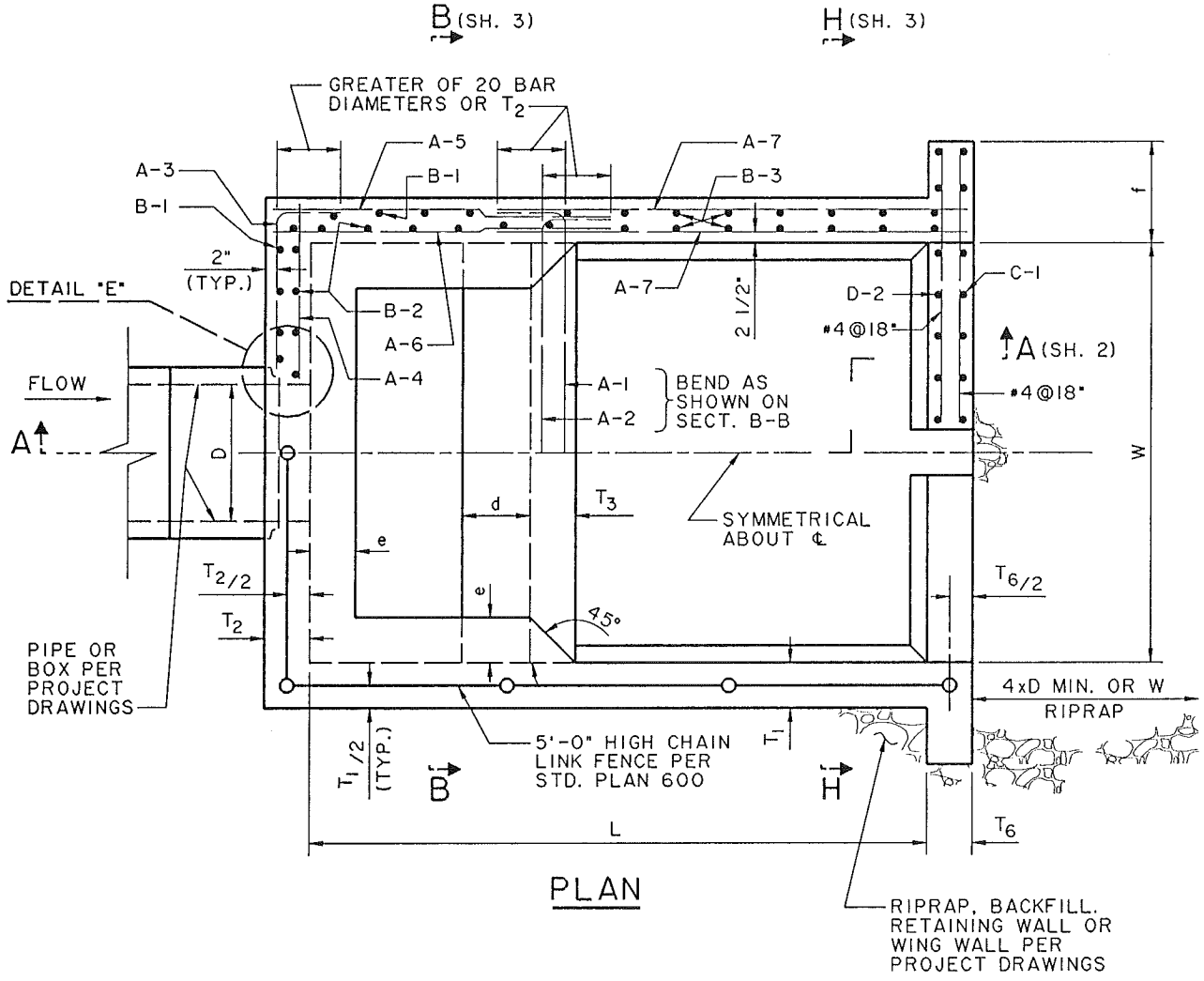
weir eqn: $Q = CLH^{1.5}$; C = 3.3 per Table 5-3 of King's Handbook

$H = (Q/CL)^{2/3}$
H = 5.28 feet

Then :

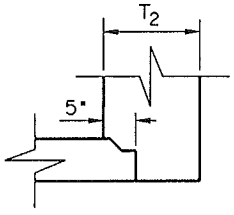
A = 53 sq. ft.
v = 7.58 fps

See riprap sizing spreadsheet for sizing based upon this velocity.

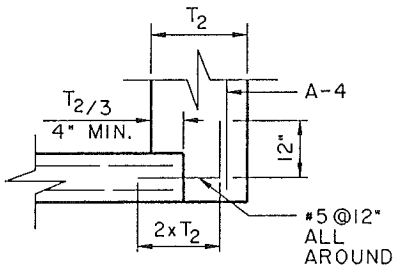


PLAN

RIPRAP, BACKFILL. RETAINING WALL OR WING WALL PER PROJECT DRAWINGS



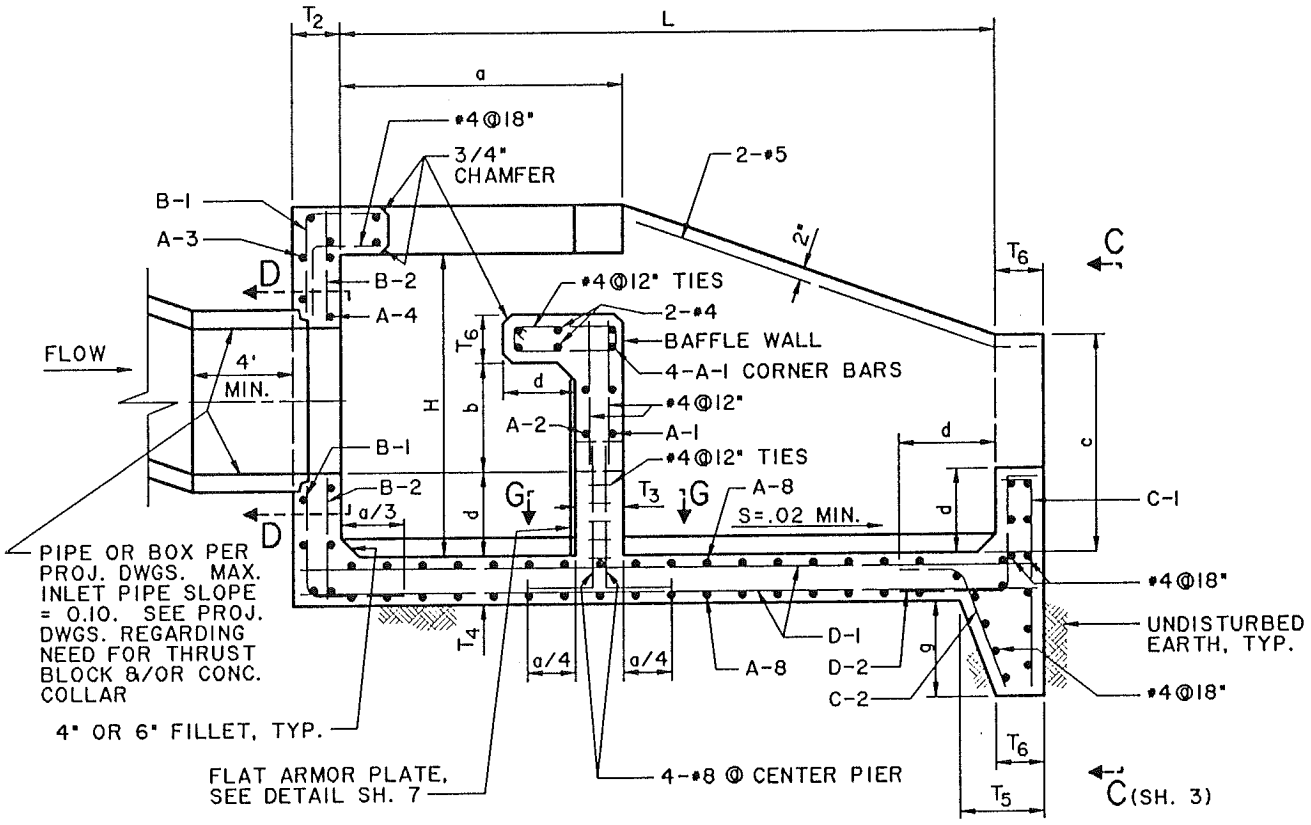
RCP (TYP.)



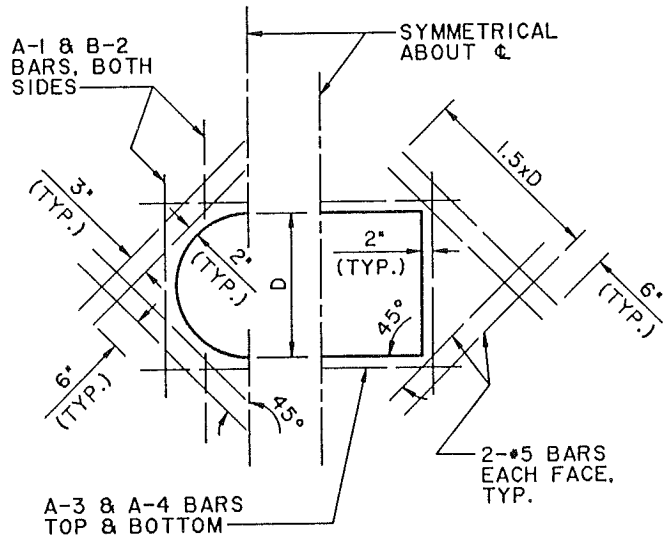
RCB (TYP.)

DETAIL "E"

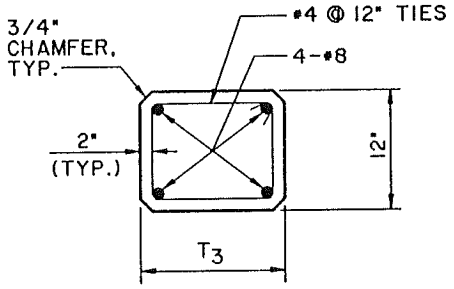
AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER		
PROMULGATED BY THE APWA-AGC JOINT COOPERATIVE COMMITTEE 1993	**ENERGY DISSIPATOR - IMPACT BASIN WITH VERTICAL BAFFLE WALL** USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN **384-0** SHEET 1 OF 8



SECTION A-A



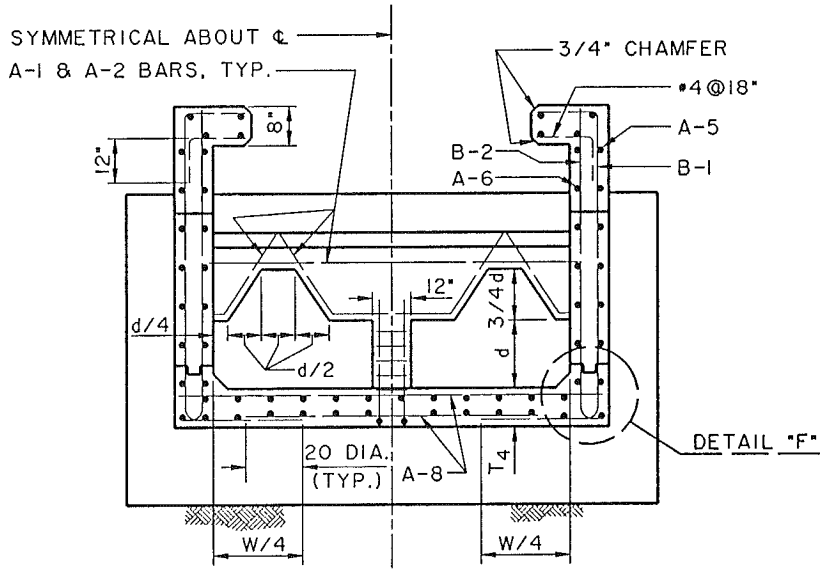
SECTION D-D



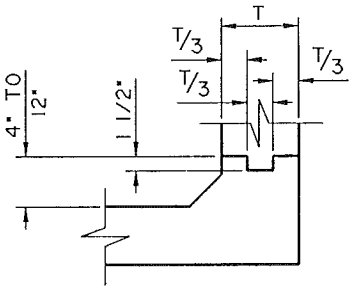
NOTE:
FLAT ARMOR PLATE NOT SHOWN.

SECTION G-G

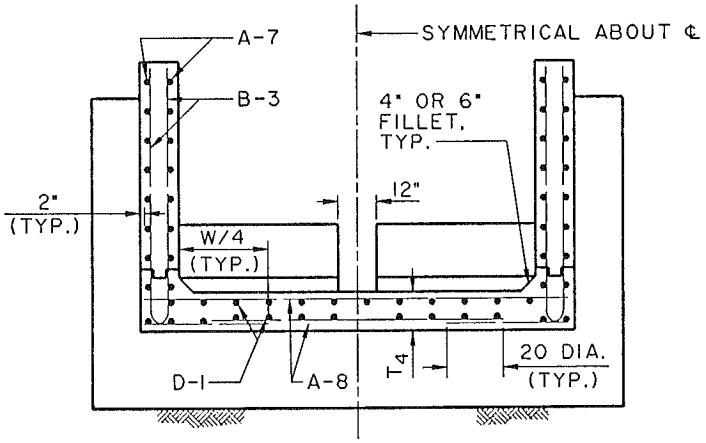
AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384-0**
	SHEET 2 OF 8



SECTION B-B (SH. 1)

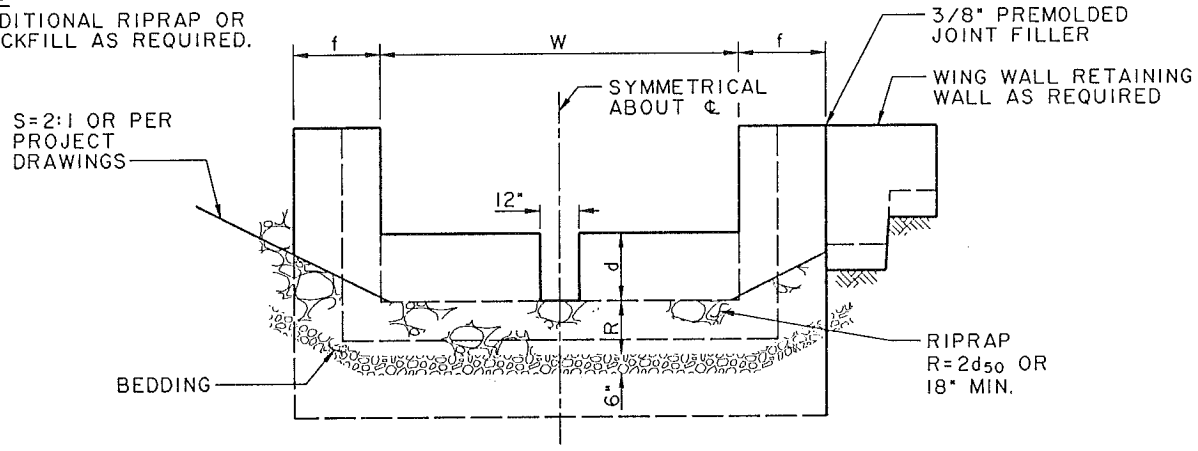


DETAIL "F"



SECTION H-H (SH. 1)

NOTE:
ADDITIONAL RIPRAP OR BACKFILL AS REQUIRED.



SECTION C-C (SH. 2)

AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER	STANDARD PLAN
ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL	**384-0**
	SHEET 3 OF 8

BASIN WIDTH W = 4'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	3'	A-1	#4 @12"	#4 @12"
L	5'-6"	A-2	#4 @12"	#4 @12"
a	2'	A-3	#4 @18"	#4 @18"
b	1'-6"	A-4	#4 @18"	#4 @18"
c	2'	A-5	#4 @18"	#4 @18"
d	8"	A-6	#4 @12"	#4 @12"
e	4"	A-7	#4 @12"	#4 @12"
f	2'	A-8	#4 @12"	#4 @12"
g	3"	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#4 @12"	#4 @12"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 225 PSF		

BASIN WIDTH W = 6'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	4'-6"	A-1	#4 @12"	#4 @12"
L	8'	A-2	#4 @12"	#4 @12"
a	3'	A-3	#4 @18"	#4 @18"
b	2'-3"	A-4	#4 @18"	#4 @18"
c	3'	A-5	#4 @18"	#4 @18"
d	1'	A-6	#4 @12"	#4 @12"
e	6"	A-7	#4 @12"	#4 @12"
f	2'	A-8	#4 @12"	#4 @12"
g	3'	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#4 @12"	#4 @12"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 300 PSF		

BASIN WIDTH W = 8'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	6'	A-1	#5 @12"	#4 @12"
L	11'	A-2	#5 @12"	#4 @12"
a	4'	A-3	#4 @18"	#4 @18"
b	3'	A-4	#4 @18"	#4 @18"
c	4'	A-5	#4 @18"	#4 @18"
d	1'-4"	A-6	#5 @12"	#4 @12"
e	8"	A-7	#4 @12"	#4 @12"
f	2'	A-8	#4 @12"	#4 @12"
g	3'	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#4 @12"	#4 @12"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 375 PSF		

BASIN WIDTH W = 10'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	7'-6"	A-1	#6 @12"	#5 @12"
L	13'-6"	A-2	#7 @12"	#6 @12"
a	5'	A-3	#4 @18"	#4 @18"
b	3'-9"	A-4	#4 @18"	#4 @18"
c	5'	A-5	#4 @18"	#4 @18"
d	1'-8"	A-6	#7 @12"	#6 @12"
e	10"	A-7	#5 @14"	#5 @14"
f	2'	A-8	#5 @11"	#4 @12"
g	4'	B-1	#4 @12"	#4 @12"
T_1	8"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#6 @18"	#6 @18"
T_3	8"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 450 PSF		

BASIN WIDTH W = 12'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	9'	A-1	#9 @18"	#6 @12"
L	16'	A-2	#9 @18"	#6 @12"
a	6'	A-3	#4 @18"	#4 @18"
b	4'-6"	A-4	#4 @18"	#4 @18"
c	6'	A-5	#4 @18"	#4 @18"
d	2'	A-6	#8 @12"	#7 @12"
e	12"	A-7	#5 @12"	#5 @12"
f	2'-6"	A-8	#7 @12"	#5 @12"
g	5'	B-1	#4 @12"	#4 @12"
T_1	9"	B-2	#4 @12"	#4 @12"
T_2	8"	B-3	#5 @12"	#5 @12"
T_3	10"	C-1	#4 @18"	#4 @18"
T_4	8"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 525 PSF		

BASIN WIDTH W = 14'				
DIMENSIONS		REINFORCING STEEL		
		DESIGNATION	SIZE & SPACING WORKING STRESS	SIZE & SPACING STRENGTH DESIGN
H	10'-6"	A-1	#8 @12"	#8 @18"
L	18'-6"	A-2	#8 @12"	#8 @18"
a	7'	A-3	#4 @12"	#4 @18"
b	5'-3"	A-4	#4 @18"	#4 @18"
c	7'	A-5	#4 @12"	#4 @18"
d	2'-4"	A-6	#9 @12"	#8 @12"
e	1'-2"	A-7	#5 @10"	#5 @10"
f	3'	A-8	#8 @12"	#6 @11"
g	5'-6"	B-1	#4 @12"	#4 @12"
T_1	10"	B-2	#4 @12"	#4 @12"
T_2	10"	B-3	#6 @15"	#6 @15"
T_3	12"	C-1	#4 @18"	#4 @18"
T_4	8.5"	C-2	#4 @18"	#4 @18"
T_5	9"	D-1	#4 @12"	#4 @12"
T_6	9"	D-2	#4 @18"	#4 @18"
DESIGN LOADS		IMPACT = 600 PSF		

West Outfall

East Outfall

NOTES:
1. BASIN FULL + IMPACT ON BAFFLE WALL.
2. BASIN FULL + 1/2 IMPACT ON THE OTHER WALLS.
3. STRENGTH DESIGN: LIVE LOAD FACTOR = 1.7
   DEAD LOAD FACTOR = 1.4

AMERICAN PUBLIC WORKS ASSOCIATION – SOUTHERN CALIFORNIA CHAPTER

ENERGY DISSIPATOR – IMPACT BASIN WITH VERTICAL BAFFLE WALL

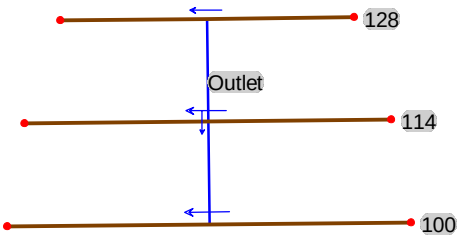
STANDARD PLAN
384-0
SHEET 4 OF 8

Non Erosive velocity at the discharge point

Preliminary Rip Rap determination at 78" RCP outlet into Otay River.

HEC-RAS Plan: Plan 01 River: Village 8 Rip ra Reach: Outlet Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Outlet	100	PF 1	774.35	100.00	104.30	102.95	104.77	0.007319	5.49	140.92	42.55	0.53
Outlet	114	PF 1	774.35	100.07	104.28		104.95	0.011271	6.56	118.07	37.62	0.65
Outlet	128	PF 1	774.35	100.14	104.21		105.25	0.019606	8.19	94.49	32.48	0.85



Some schematic data outside default extents (see View/Set Schematic Plot Extents...)

APPENDIX C
GEOLOGIC MAPS AND SUBDRAIN OUTLET HEADWALL DETAIL

OLYMPIAN HIGH SCHOOL

CHULA VISTA TRACT NO. 05-07
MCMILLIN OTAY RANCH
VILLAGE "A" MAP
MAP NO. 15014

644-070-14
644-241-04
644-070-10

LOT 11

OTAY RANCH

Qpf
Qal
To
Tog

B-1 (2') 545
B-2 (2')
B-3 (2') 526
B-4 (3') 577
B-5 (3')
B-6 (2')
B-13 (2.5') 538 529
B-16 (2') 585
B-17 (1') 573

T-5 (5')
T-6 (4')
T-7 (2')
T-8 (2')
T-10 (1.5')
T-11 (3.5')
T-12 (4.5')
T-13 (5.5')
T-14 (5')
T-36 (4')
T-37 (4')
T-38 (3')

C.O.A.

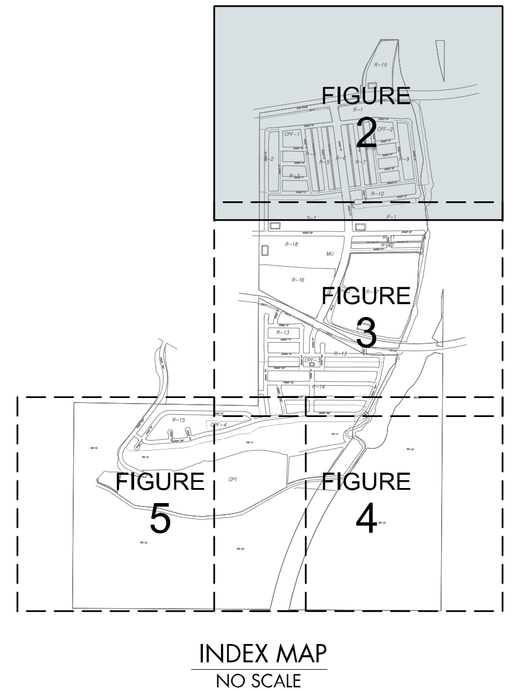
LOT AREA: 15.3 AC.
PAD AREA: 14.9 AC.
LOT AREA: 12.6 AC.
PAD AREA: 12.4 AC.
LOT AREA: 11.0 AC.
PAD AREA: 10.0 AC.
LOT AREA: 8.3 AC.
PAD AREA: 8.0 AC.
LOT AREA: 8.9 AC.

PRIVATE OPEN SPACE 'B'
LOT AREA: 6.9 AC.
PAD AREA: 0.7 AC.

FREEWAY LOT 1
LOT AREA: 1.7 AC.
FREEWAY LOT 2
LOT AREA: 1.0 AC.

CONSTRUCTION LIMIT
PROPOSED SR-125 RIGHT OF WAY ADJUSTMENT
PROPOSED SLOPE MAINTENANCE EASEMENT
SUBDRAIN OUTLET
PROPOSED SLOPE MAINTENANCE

N20°15'39"W 655.98'
N71°57'57"E 129.18'
N71°57'57"E 231.74'
N68°06'30"E 26.60'



INDEX MAP
NO SCALE

GRAPHIC SCALE
0' 75' 150' 225' 300' 450' 600'
SCALE 1"= 150'

GEOCON LEGEND

- Qpf ..... PREVIOUSLY PLACED FILL (Geotechnics, 2005)
- Qudf ..... UNDOCUMENTED FILL
- Qal ..... ALLUVIUM
- Qt ..... TERRACE DEPOSITS (Dotted Where Buried)
- To ..... OTAY FORMATION
- Tog ..... OTAY FORMATION (Grltstone)
- (3') ..... APPROX. DEPTH TO FORMATIONAL (In Feet)
- ..... APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)
- B-19 ..... APPROX. LOCATION OF EXPLORATORY BORING
- T-57 ..... APPROX. LOCATION OF EXPLORATORY TRENCH
- F F' ..... APPROX. LOCATION OF GEOLOGIC CROSS SECTIONS
- 577 ..... APPROX. ELEVATION OF BENTONITE CLAYSTONE (In Feet)
- ..... APPROX. LOCATION OF BENTONITE CLAYSTONE BED (Queried Where Uncertain)
- ..... APPROX. LOCATION OF PROPOSED CANYON SUBDRAIN 6-INCH 8-INCH
- ..... APPROX. LOCATION OF EXISTING SUBDRAIN (Geotechnics, 2005)
- 524 ..... APPROX. ELEVATION OF EXISTING SUBDRAIN
- W=30' ..... REQUIRED WIDTH OF BUTTRESS (In Feet)

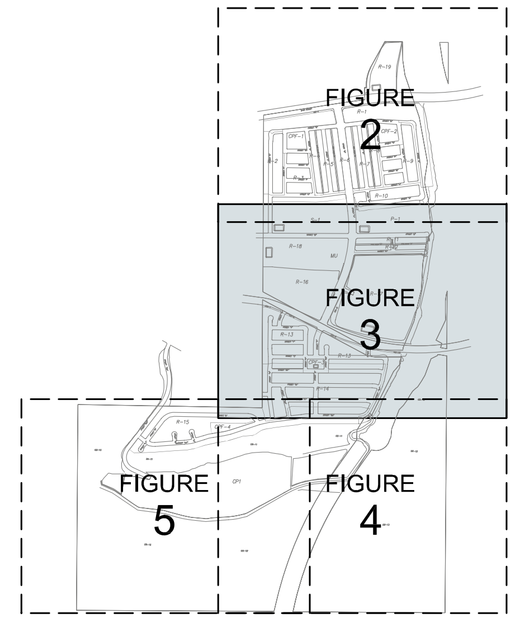
GEOLOGIC MAP

OTAY RANCH - VILLAGE 8 EAST
CHULA VISTA, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 150'	DATE	11 - 21 - 2012
PROJECT NO.	G1006 - 11 - 02	FIGURE	2
SHEET	1 OF 4		

Y:\PROJECTS\G1006-11-02 (University Village 8)\SHEETS\G1006-11-02 GEOMAP (11x17-v2).dwg



INDEX MAP
NO SCALE

GRAPHIC SCALE
0' 75' 150' 225' 300' 450' 600'
SCALE 1"= 150'

GEOCON LEGEND

- Qpf ..... PREVIOUSLY PLACED FILL (Geotechnics, 2005)
- Qudf ..... UNDOCUMENTED FILL
- Qal ..... ALLUVIUM
- Qt ..... TERRACE DEPOSITS (Dotted Where Buried)
- To ..... OTAY FORMATION
- Tog ..... OTAY FORMATION (Gritstone)
- (3') ..... APPROX. DEPTH TO FORMATIONAL (In Feet)
- ..... APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)
- B-19 ..... APPROX. LOCATION OF EXPLORATORY BORING
- T-57 ..... APPROX. LOCATION OF EXPLORATORY TRENCH
- F F' ..... APPROX. LOCATION OF GEOLOGIC CROSS SECTIONS
- 577 ..... APPROX. ELEVATION OF BENTONITE CLAYSTONE (In Feet)
- ..... APPROX. LOCATION OF BENTONITE CLAYSTONE BED (Queried Where Uncertain)
- ..... APPROX. LOCATION OF PROPOSED CANYON SUBDRAIN (6-INCH, 8-INCH)
- ..... APPROX. LOCATION OF EXISTING SUBDRAIN (Geotechnics, 2005)
- 524 ..... APPROX. ELEVATION OF EXISTING SUBDRAIN
- W=30' ..... REQUIRED WIDTH OF BUTTRESS (In Feet)

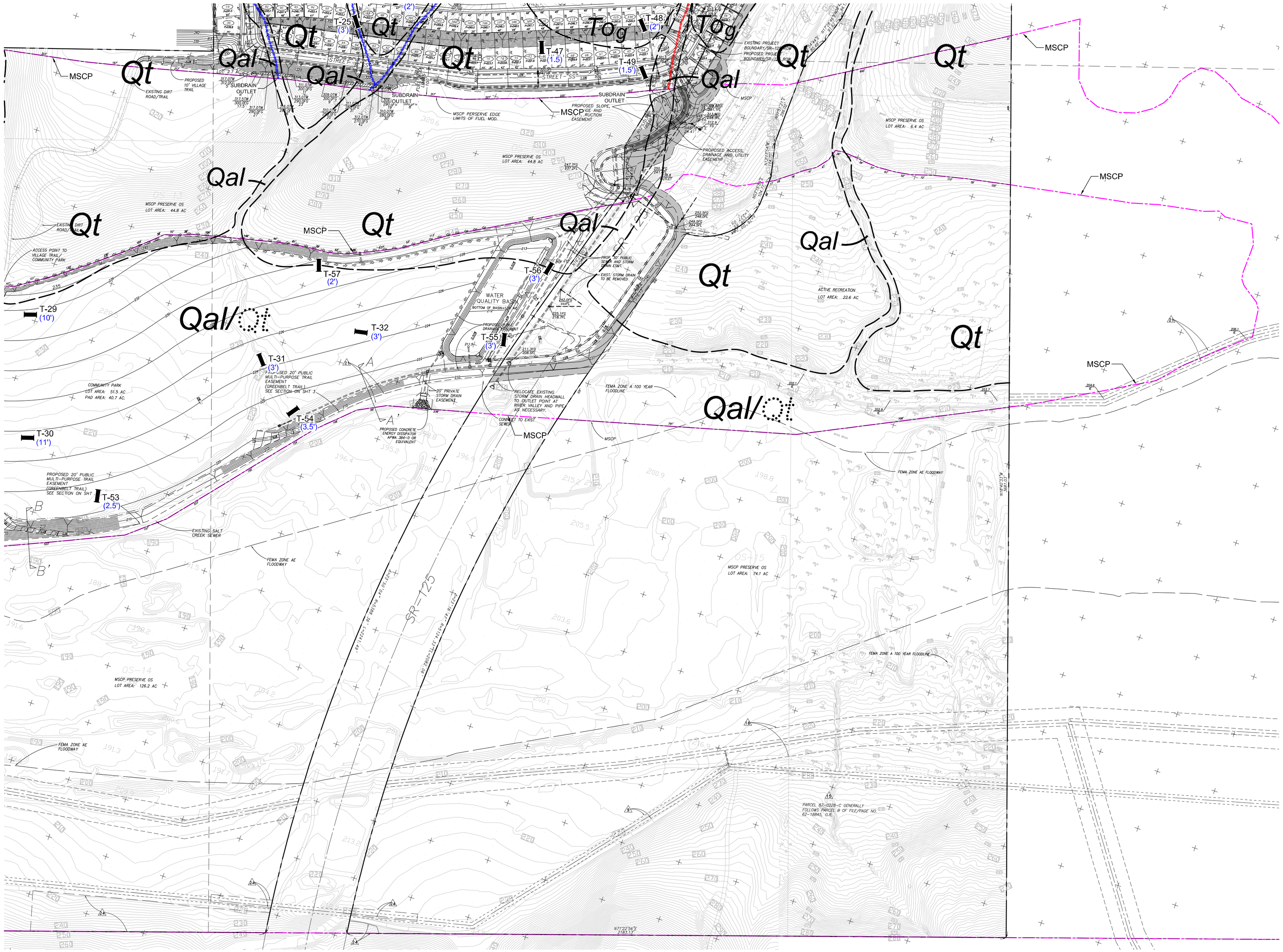
GEOLOGIC MAP

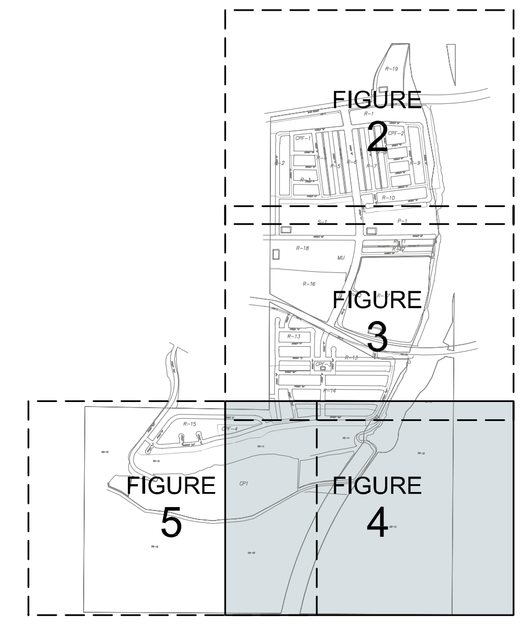
OTAY RANCH - VILLAGE 8 EAST
CHULA VISTA, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 150'	DATE 11 - 21 - 2012
PROJECT NO. G1006 - 11 - 02	FIGURE 3
SHEET 2 OF 4	

Y:\PROJECTS\G1006-11-02 (University Village 8)\GIR-RS\TSG\1006-11-02 GEOMAP (11-21-12).dwg





INDEX MAP
NO SCALE

GRAPHIC SCALE
0' 75' 150' 225' 300' 450' 600'
SCALE 1"= 150'

GEOCON LEGEND

- Qpf .....PREVIOUSLY PLACED FILL (Geotechnics, 2005)
- Qudf .....UNDOCUMENTED FILL
- Qal .....ALLUVIUM
- Qt .....TERRACE DEPOSITS (Dotted Where Buried)
- To .....OTAY FORMATION
- Tog .....OTAY FORMATION (Gritstone)
- (3') .....APPROX. DEPTH TO FORMATIONAL (In Feet)
- .....APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)
- B-19 .....APPROX. LOCATION OF EXPLORATORY BORING
- T-57 .....APPROX. LOCATION OF EXPLORATORY TRENCH
- F F' .....APPROX. LOCATION OF GEOLOGIC CROSS SECTIONS
- 577 .....APPROX. ELEVATION OF BENTONITE CLAYSTONE (In Feet)
- ? .....APPROX. LOCATION OF BENTONITE CLAYSTONE BED (Queried Where Uncertain)
- .....APPROX. LOCATION OF PROPOSED CANYON SUBDRAIN 6-INCH 8-INCH
- .....APPROX. LOCATION OF EXISTING SUBDRAIN (Geotechnics, 2005)
- 524 .....APPROX. ELEVATION OF EXISTING SUBDRAIN
- W=30' .....REQUIRED WIDTH OF BUTTRESS (In Feet)

GEOLOGIC MAP

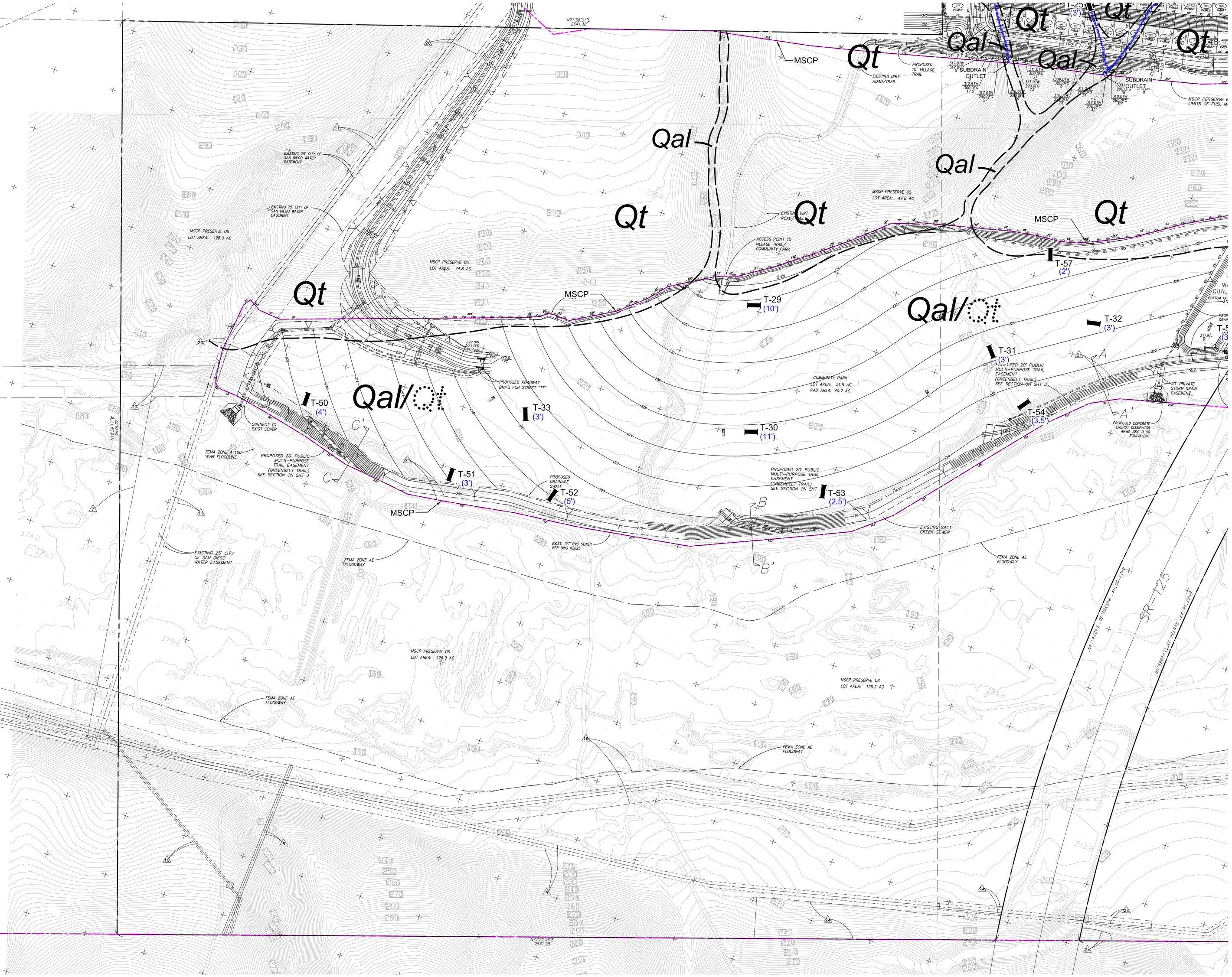
OTAY RANCH - VILLAGE 8 EAST
CHULA VISTA, CALIFORNIA

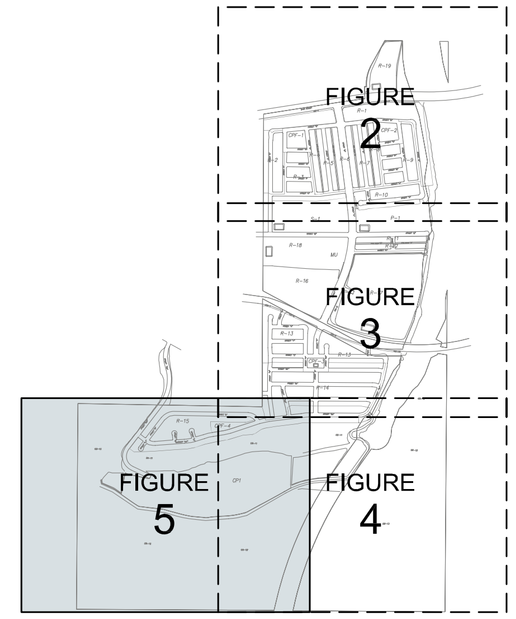
Revised Date 10-16-2013

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

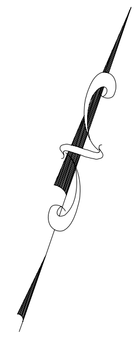
SCALE	1" = 150'	DATE	11 - 21 - 2012
PROJECT NO.	G1006 - 11 - 02	FIGURE	4
SHEET	3 OF 4		

Y:\FNO\JEC\TGI\1006+11\02 (University Village) 8)\SHEET\TSG\1006+11\02 Geo Map (10-16-2013).dwg





INDEX MAP
NO SCALE



GRAPHIC SCALE
0' 75' 150' 225' 300' 450' 600'
SCALE 1" = 150'

GEOCON LEGEND

- Qpf .....PREVIOUSLY PLACED FILL (Geotechnics, 2005)
- Qudf .....UNDOCUMENTED FILL
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- 524 .....APPROX. ELEVATION OF EXISTING SUBDRAIN
- W=30' .....REQUIRED WIDTH OF BUTTRESS (In Feet)

GEOLOGIC MAP

OTAY RANCH - VILLAGE 8 EAST
CHULA VISTA, CALIFORNIA

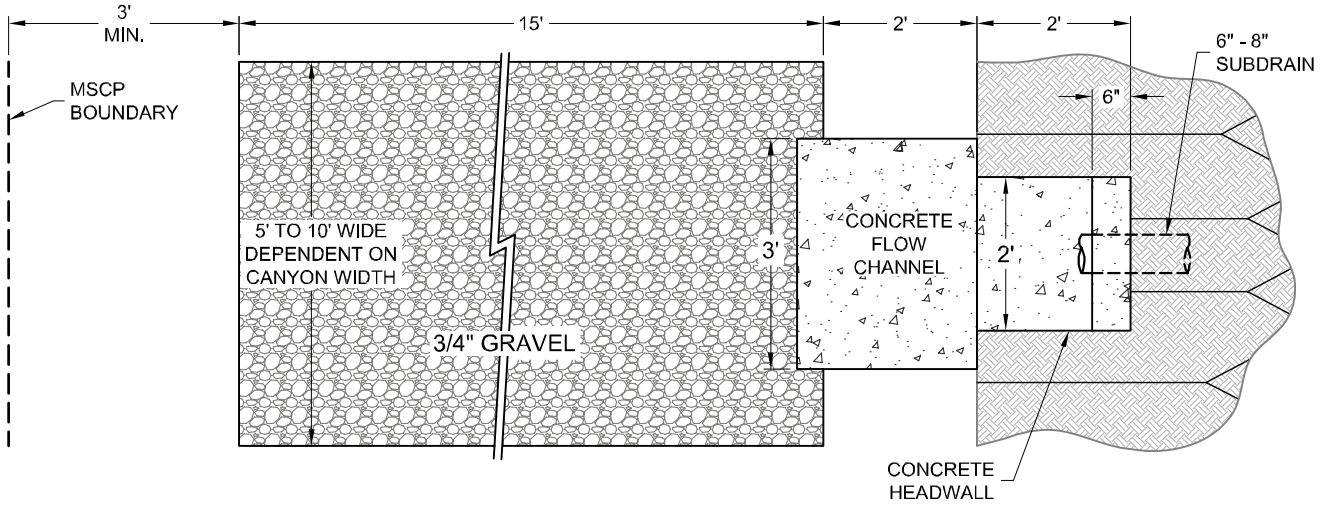
Revised Date 10-16-2013

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 150'	DATE	11 - 21 - 2012
PROJECT NO.	G1006 - 11 - 02	FIGURE	5
SHEET	4 OF 4		

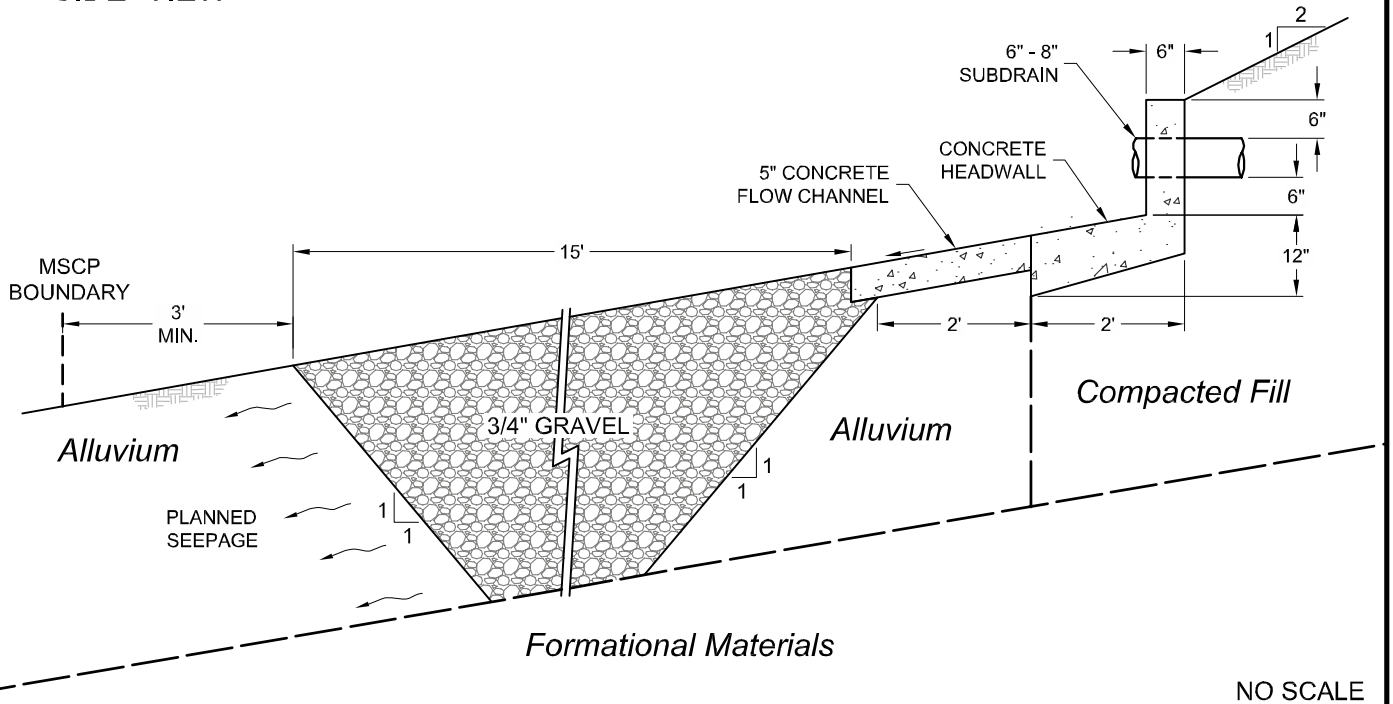
Y:\PROJECTS\G1006-11-02 (University Village 8)\SHEETS\G1006-11-02 Geo Map (10-16-2013).dwg

PLAN VIEW



NO SCALE

SIDE VIEW



NO SCALE

SUBDRAIN OUTLET HEADWALL DETAIL

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

JH / AML		DSK/GTYPD

OTAY RANCH - VILLAGE 8 EAST
CHULA VISTA, CALIFORNIA

DATE 11 - 21 - 2012	PROJECT NO. G1006 - 11 - 02	FIG. 10

APPENDIX D
VILLAGE 8 WEST REFERENCE DRAINAGE REPORT

FINAL

Drainage Study

For

Otay Ranch

Village 8 West

Chula Vista Tract No. 19-03

HALE ENGINEERING

Jill Gravely, P.E.
R.C.E. # 70843
Expiration Date: June 30, 2021

Prepared For
Homefed Village 8, LLC
1903 Wright Place, Suite 220
Carlsbad, CA 92008
(760) 602-3777

Prepared By
Hale Engineering
7910 Convoy Court
San Diego, CA 92111
(858) 715-1420

Date: October 25, 2019

Approved by: SH
Date: 12-30-2019

```
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   197.96  DOWNSTREAM(FEET) =   185.16
 FLOW LENGTH(FEET) =    93.42   MANNING'S N =  0.013
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  29.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  42.30
 ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     306.14
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   21.46
 LONGEST FLOWPATH FROM NODE     0.00 TO NODE    581.00 =    6889.35 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    581.00 TO NODE    582.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   184.16  DOWNSTREAM(FEET) =   181.43
 FLOW LENGTH(FEET) =    53.82   MANNING'S N =  0.013
 DEPTH OF FLOW IN  48.0 INCH PIPE IS  38.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  28.59
 ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     306.14
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   21.50
 LONGEST FLOWPATH FROM NODE     0.00 TO NODE    582.00 =    6943.17 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    582.00 TO NODE    583.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   181.10  DOWNSTREAM(FEET) =   179.66
 FLOW LENGTH(FEET) =    37.18   MANNING'S N =  0.013
 DEPTH OF FLOW IN  51.0 INCH PIPE IS  39.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  25.97
 ESTIMATED PIPE DIAMETER(INCH) =  51.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     306.14
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   21.52
 LONGEST FLOWPATH FROM NODE     0.00 TO NODE    583.00 =    6980.35 FEET.
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =     181.2  TC(MIN.) =     21.52
 PEAK FLOW RATE(CFS)   =     306.14
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

TOTAL TO OTAY RIVER

Q50 = 306.14 CFS

```
 FLOW LENGTH(FEET) =   93.42  MANNING'S N =  0.013
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  32.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  42.95
 ESTIMATED PIPE DIAMETER(INCH) =  42.00   NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =    347.24
 PIPE TRAVEL TIME(MIN.) =  0.04   Tc(MIN.) =  21.34
 LONGEST FLOWPATH FROM NODE     0.00 TO NODE   581.00 =   6889.35 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   581.00 TO NODE   582.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  184.16  DOWNSTREAM(FEET) =  181.43
 FLOW LENGTH(FEET) =   53.82  MANNING'S N =  0.013
 DEPTH OF FLOW IN  51.0 INCH PIPE IS  39.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  29.70
 ESTIMATED PIPE DIAMETER(INCH) =  51.00   NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =    347.24
 PIPE TRAVEL TIME(MIN.) =  0.03   Tc(MIN.) =  21.37
 LONGEST FLOWPATH FROM NODE     0.00 TO NODE   582.00 =   6943.17 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   582.00 TO NODE   583.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  181.10  DOWNSTREAM(FEET) =  179.66
 FLOW LENGTH(FEET) =   37.18  MANNING'S N =  0.013
 DEPTH OF FLOW IN  54.0 INCH PIPE IS  40.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  26.91
 ESTIMATED PIPE DIAMETER(INCH) =  54.00   NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =    347.24
 PIPE TRAVEL TIME(MIN.) =  0.02   Tc(MIN.) =  21.39
 LONGEST FLOWPATH FROM NODE     0.00 TO NODE   583.00 =   6980.35 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)    =    181.2  TC(MIN.) =    21.39
 PEAK FLOW RATE(CFS)  =    347.24
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

TOTAL TO OTAY RIVER

Q = 347.24 CFS

VILLAGE 7
OFF-SITE FLOW
AREA = 89.63 AC

SANTA LUNA ROAD

BASIN 4
NORTH TOWN CENTER
155.5 ACRES

D-A
D-B
D-C
C-A
C-B
A
B
MEDIA PKWY SOUTH
NORTH HILTON
MAGDALENA AVENUE

MAIN ST. WEST

WATER QUALITY AND
HYDRO-MODIFICATION
BASIN
E

MAIN ST. WEST
F
G
W
H1-A
H1-C
H1-B
H1-D
H2
LA MEDIA PKWY

WOLF
CANYON

VILLAGE 7
OFF-SITE FLOW
AREA = 20.10 AC

ROCK MTN. ROAD

OTAY
RIVER

MAIN ST. EAST

G2
M
J
L-A
L-B
L-C
L-D
AVENIDA CAPRISE

BASIN 5
SOUTH TOWN CENTER
61.7 ACRES

VIA ESTANCIA
PASEO ELEVADO
LA

WOLF
CANYON

OTAY
RIVER

LEGEND

- MULTI-COMMERCIAL AREA
- MULTI-FAMILY HOUSING
- OPEN SPACE
- SINGLE FAMILY HOUSING
- OPEN SPACE: PARK
- SCHOOL
- WOLF CANYON AND OTAY VALLEY RIVER DIVISION
- BASIN DIVISION

SCALE 1" = 80'

SCALE 1" = 80'

HALE ENGINEERING
7510 CONVOY COURT
SAN DIEGO, CA 92111
(858) 751-1420
(858) 751-1449 FAX

DEVELOPED CONDITIONS HYDROLOGY MAP
DRAINAGE STUDY FOR OTAY RANCH VILLAGE 8 WEST
PER TENTATIVE MAP REVISION DATED _____
CHULA VISTA TRACT NO. 19-03
CITY OF CHULA VISTA, CALIFORNIA

SHEET 1 OF 4

BASIN 5
SOUTH TOWN CENTER
61.7 ACRES

BASIN 3
115.2 ACRES

WOLF CANYON

OTAY RIVER

EXISTING RESERVOIR

VIA ESTANCIA

VIA MIRAFLORES

VIA FERRO

PASEO EVANTEN

PASEO LEVANTEN

LA MEDIA PKWY

AVENIDA CAPRISE

L-A

J

O

S

R-A

R-B

R-C

Q

T

U

PORTION OF LA MEDIA PARKWAY TO DRAIN OFFSITE, SEE APPENDIX O.

LEGEND

- MULTI-COMMERCIAL AREA
- MULTI-FAMILY HOUSING
- OPEN SPACE
- SINGLE FAMILY HOUSING
- OPEN SPACE: PARK
- SCHOOL
- WOLF CANYON AND OTAY VALLEY RIVER DIVISION
- BASIN DIVISION

SCALE: 1" = 80'

80 0 80 160 240
SCALE 1" = 80'

HALE ENGINEERING
769 CORPET COURT
SAN DIEGO, CA 92113
(858) 755-1400
(858) 755-1404 FAX

DEVELOPED CONDITIONS HYDROLOGY MAP
DRAINAGE STUDY FOR OTAY RANCH VILLAGE 8 WEST
PER TENTATIVE MAP REVISION DATED _____
CHULA VISTA TRACT NO. 19-03
CITY OF CHULA VISTA, CALIFORNIA

SHEET 2 OF 4

BASIN 3
115.2 ACRES

BASIN 1
NEIGHBORHOOD P
31.4 ACRES

BASIN 2
NEIGHBORHOOD V
34.0 ACRES

WOLF CANYON

OTAY RIVER

VIA ESTANCIA

PASEO LEVANTADO

LA MEDIA PKWY

R-A

R-B

R-C

Q

S

T

U

PORTION OF LA MEDIA PARKWAY TO DRAIN OFFSITE, SEE APPENDIX O.

AVENIDA CAPRISE

CALLE MATEO

PASEO ARCHER

PASEO LIMONITE

CALLE GRANDON

MSCP LIMIT

MSCP LIMIT

LEGEND

- MULTI-COMMERCIAL AREA
- MULTI-FAMILY HOUSING
- OPEN SPACE
- SINGLE FAMILY HOUSING
- OPEN SPACE: PARK
- SCHOOL
- WOLF CANYON AND OTAY VALLEY RIVER DIVISION
- BASIN DIVISION

SCALE: 1" = 80'

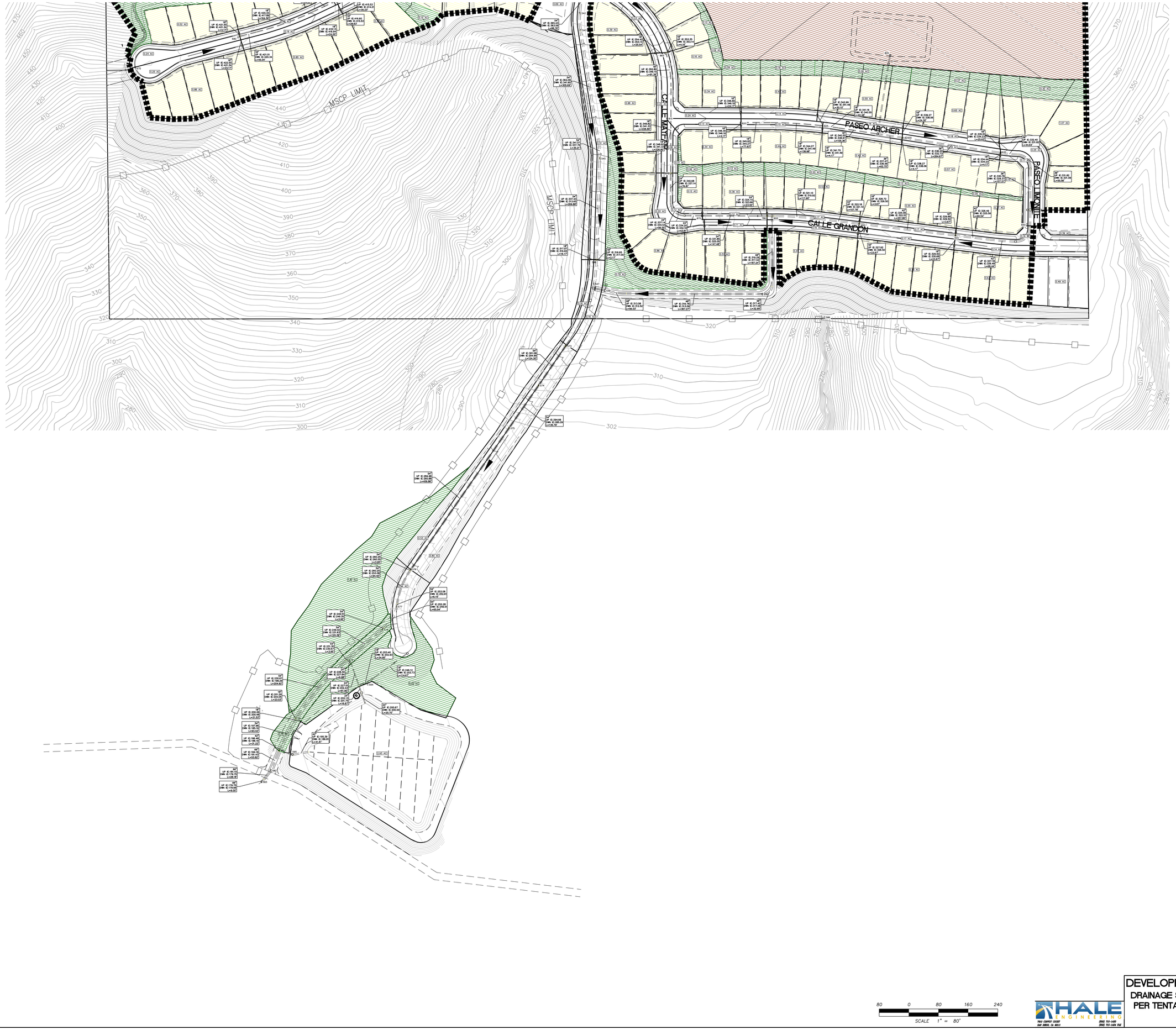
80 0 80 160 240

SCALE 1" = 80'

HALE ENGINEERING
7888 CENTRY COURT
SAN DIEGO, CA 92111
(858) 715-1400
(858) 715-1414 FAX

DEVELOPED CONDITIONS HYDROLOGY MAP
DRAINAGE STUDY FOR OTAY RANCH VILLAGE 8 WEST
PER TENTATIVE MAP REVISION DATED _____
CHULA VISTA TRACT NO. 19-03
CITY OF CHULA VISTA, CALIFORNIA

SHEET 3 OF 4



LEGEND

- MULTI-COMMERCIAL AREA
- MULTI-FAMILY HOUSING
- OPEN SPACE
- SINGLE FAMILY HOUSING
- OPEN SPACE: PARK
- SCHOOL
- WOLF CANYON AND OTAY VALLEY RIVER DIVISION
- BASIN DIVISION

SCALE: 1" = 80'

80 0 80 160 240

SCALE 1" = 80'

HALE ENGINEERING
7888 CENTRE COURT
SAN DIEGO, CA 92111
(858) 715-1400
(858) 715-1414 FAX

DEVELOPED CONDITIONS HYDROLOGY MAP

DRAINAGE STUDY FOR OTAY RANCH VILLAGE 8 WEST
PER TENTATIVE MAP REVISION DATED _____

CHULA VISTA TRACT NO. 19-03
CITY OF CHULA VISTA, CALIFORNIA

SHEET 4 OF 4