Declaration of Responsible Charge

I hereby declare that I am the Civil Engineer of Work for this project. That I have exercised responsible charge over the design of the project as defined in Section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of the Drainage Report by the County of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for project design.

_______________________________
Gary R. Wynn
RCE 43202

9-15-2021
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Map Pocket 2: Post-Project Hydrologic Work Map for Clarke Vet and Dental Clinics
INTRODUCTION 1.0

The project site fronts Valley Center Road and is located approximately 400 feet north of the intersection with Woods Valley Road. The site is bounded by open space to the south and adjacent to commercial buildings. Refer to the Vicinity Map shown at the end of this section. The site slopes towards the northeast on an average 10% slope. The site is located within Valley Center Hydrologic Sub-Area (HSA 903.14), which is part of the Lower San Luis Hydrologic Area (HA 903.10) and San Luis Rey Hydrologic Unit (HU 903.00).

The project proposes to develop a vacant lot into a two commercial buildings and associated surface improvements. Offsite improvements include the removal of existing driveway opening on the southeast end and a new driveway opening on the northeast. In the Pre-project condition, a portion of the hillside south of the project sheet flows onto the site and confluences with site flows in a northeasterly direction. The majority of the flows are captured by a concrete brow ditch on the adjacent property along the northerly property line. Those flows converge with surrounding flows associated with Valley Center Road. Runoff comingle with flows from Valley Center Road via a public storm drain constructed as part of Valley Center Road Improvements (RS 01838-3,4,5,6). Runoff continues its course north eventually discharging into Moosa Canyon Creek. Flows continue west on Moosa Canyon Creek eventually joining with San Luis Rey River which ultimately outlets to the Pacific Ocean.

In the Post-project condition, drainage areas and patterns will not be altered or diverted. Offsite flows will be bypassed and not comingle with project runoff. Storm water runoff from the project will flow into two biofiltration basins. The largest basin will be sized as a conjunctive use facility to meet pollutant, hydromodification and flood control requirements. The increase of impervious surfaces will generate additional runoff. However, through the use of Low Impact Development (LID) practices and conjunctive use facility, flows leaving the site will be detained to be equal or less than pre-project condition.

STORM WATER PLAN REQUIREMENTS 1.1

The site design BMPs, source control and treatment control BMPs that will be utilized to address water quality for the project are described in the Storm Water Quality Management Plan (SWQMP) titled, “Priority Development Project Major Storm Water Quality Management Plan (PDP SWQMP) for Clarke Vet and Dental Clinics”, prepared by Wynn Engineering, Inc.
HYDROLOGIC METHODOLOGY AND CRITERIA 2.0

This study has been prepared consistent with current County of San Diego’s ordinances and procedures. All components of the study are designed to convey storm water based on a 100-year flood event. The anticipated storm runoff has been calculated using the Rational Method based on the 2003 County of San Diego Hydrology Manual.

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures.

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (Tc), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed as follows:

\[ Q = C I A \]

- \( Q \) = peak discharge, cubic feet per second (cfs)
- \( C \) = runoff coefficient, based on San Diego County Hydrology Manual (Refer to Appendix A)
- \( I \) = Rainfall intensity (in/hr) (Refer to Appendix A)
- \( A \) = Drainage Area, (Acres)

The RM formula is based on the assumption that for constant rainfall intensity, the peak discharge rate at a point will occur when the raindrop that falls at the most upstream point in the tributary drainage basin arrives at the point of interest.

Runoff coefficients (C) based on land use and soil types were obtained from the County of San Diego Hydrology Manual, Table 3-1. Soil types were determined from the US Department of Agriculture (USDA) Soil Survey program. This runoff coefficient was then multiplied by the percentage of total area (A) included in that class.

The rainfall intensity (I) can be determined from the County of San Diego Intensity-Duration
Design Chart. The 6-hour storm rainfall amount (P6) and 24-hour storm rainfall amount (P24), were determined from the isopluvial maps provided in Appendix A. Intensity can also be calculated using the following equation:

\[ I = 7.44 \times (P_6) \times (D^{-0.645}) \]

I = Intensity (inches/hour)

\( P_6 \) = 6 Hour Precipitation (inches)

D = Duration in minutes (use Tc)

The Time of Concentration (Tc) is the time required for runoff to flow from the most remote part of the drainage area to the point of interest. The Tc is composed of two components: initial time of concentration (Ti) and travel time (Tt). The Ti is the time required for runoff to travel across the surface of the most remote subarea in the study, or “initial subarea.” The Tt is the time required for the runoff to flow in a watercourse or series of watercourses from the initial subarea to the point of interest. For the RM, the Tc at any point within the drainage area is given by:

\[ Tc = Ti + Tt \]

\[ Tt = (11.9 \times L^3 / \Delta E)^{0.385} \]

L = Longest flow path distance (mi)

\( \Delta E \) = Change in elevation along flowpath (ft)

The Advanced Engineering Software, based on the 2003 County of San Diego Hydrology Manual, was used to determine on-site 100-year, 6-hour peak flow rates.

The Advanced Engineering Software is a computer-aided design program in which the user develops a node-link model of the watershed. The hydrologic model is developed by creating independent node-link models of each interior drainage basin and linking these sub-models together at confluence points. The program has the capability to perform calculations for 11 hydrologic processes. These processes are assigned code numbers that appear in the results. The code numbers and their significance are as follows:

**Subarea Hydrologic Processes (Codes)**

Code 1: Confluence analysis at node

Code 2: Initial subarea analysis, top of stream
Code 3: Pipe/box/culvert travel time (program estimated pipe size)
Code 4: Pipe/box/culvert travel time (user specified pipe size)
Code 5: Open channel travel time
Code 6: Streetflow analysis thru subarea
Code 7: User specified hydrology data at a node
Code 8: Addition of subarea runoff to main stream
Code 9: V-gutter flow thru subarea
Code 10: Copy main stream data onto memory bank
Code 11: Confluence a memory bank with the main stream memory
Code 12: Clear a memory bank
Code 13: Clear the main stream
Code 14: Copy a memory bank onto the main stream memory
Code 15: Hydrologic data bank storage function
Code 16: User specified source flow at a node

HYDROLOGIC RESULTS 3.0

The 100-year 6-hour peak flow rates for the pre- and post-project conditions can be found in Table 3.1. Drainage Basin boundaries, and drainage areas can be found on the workmaps titled, “Pre-Project Hydrologic Workmap for Clarke Vet and Dental Clinics” and “Post-Project Hydrologic Workmap for Clarke Vet and Dental Clinics”, located in Map Pocket 1 and 2. Pre-project and post-project hydrologic analyses have been performed for the 100-year storm event. For the purpose of this drainage report one major drainage basin has been identified, herein referred to as Drainage Basin 100. Basin 100 comprised of approximately 4.1 acres which includes existing parking lot, landscaped slopes, roadways and commercial businesses adjacent to the site. Onsite runoff will be captured in private storm drain systems and discharged to existing storm drain infrastructure on Valley Center Road.

Storm water runoff from Basin 100 in the pre- and post-project condition drain to the same point of interest. Table 3.1 summarizes the results of the 100-year pre-project and post-project (undetained and detained) hydrologic analyses for Clarke Vet and Dental Clinics. The results show an increase in flows which is a result of addition of impervious surfaces onsite. In the proposed condition, the onsite area that previously discharged into concrete brow ditch via sheet
flow will be captured in private storm drain and discharged into biofiltration basins prior to discharging into the public storm drain on Valley Center Road.

Table 3.1: Summary of Pre- and Post-Project 100-Year Peak Discharge Rates

<table>
<thead>
<tr>
<th></th>
<th>Node Number</th>
<th>Area (acres)</th>
<th>Q₁₀₀ (cfs)</th>
<th>Tc (min)</th>
<th>I (in/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Project</td>
<td>105</td>
<td>4.1</td>
<td>9.0</td>
<td>11.6</td>
<td>5.7</td>
</tr>
<tr>
<td>Post-Project</td>
<td>124</td>
<td>4.1</td>
<td>19.0</td>
<td>6.0</td>
<td>8.9</td>
</tr>
<tr>
<td>(unmitigated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Project</td>
<td>124</td>
<td>4.1</td>
<td>9.0</td>
<td>12.5</td>
<td>5.5</td>
</tr>
<tr>
<td>(mitigated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION 4.0

This drainage report presents the 100-year, 6-hour post-project hydrologic analyses for the Clarke Vet and Dental Clinics Project. The post-project condition peak discharge rates were determined using the Rational Method based on the hydrologic methodology and criteria described in the San Diego County Hydrology Manual, dated June 2003. As designed, the development will not alter the natural drainage path or divert any water from the existing natural conditions or drainage boundaries. Runoff from the building roofs and hardscape adjacent to the buildings will be directed to landscaped areas prior to discharging into the biofiltration basin used as a conjunctive use facility to meet pollutant, hydromodification and flood control requirements. Since runoff from the site will be detained to pre-project levels, capacity of the existing public storm drain on Valley Center Road will not be impacted. Runoff from the site and Valley Center Road will discharge into Moosa Creek, 0.6 miles north of the site. Flows will continue west on Moosa Canyon Creek eventually joining with San Luis Rey River which ultimately outlets to the Pacific Ocean.
Appendix A: Hydrologic Reference Materials
Soil Map may not be valid at this scale.
MAP LEGEND

Area of Interest (AOI)

Soils

Soil Rating Polygons

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 15, May 27, 2020

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

Date(s) aerial images were photographed: Jan 24, 2020—Feb 12, 2020

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

<table>
<thead>
<tr>
<th>Map unit symbol</th>
<th>Map unit name</th>
<th>Rating</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co</td>
<td>Clayey alluvial land</td>
<td></td>
<td>2.3</td>
<td>35.0%</td>
</tr>
<tr>
<td>FaE2</td>
<td>Fallbrook sandy loam, 15 to 30 percent slopes, eroded</td>
<td>C</td>
<td>1.9</td>
<td>27.9%</td>
</tr>
<tr>
<td>LpC2</td>
<td>Las Posas fine sandy loam, 5 to 9 percent slopes, eroded</td>
<td>C</td>
<td>1.3</td>
<td>19.9%</td>
</tr>
<tr>
<td>LpD2</td>
<td>Las Posas fine sandy loam, 9 to 15 percent slopes, eroded</td>
<td>C</td>
<td>0.5</td>
<td>8.1%</td>
</tr>
<tr>
<td>LrE</td>
<td>Las Posas stony fine sandy loam, 9 to 30 percent slopes</td>
<td>C</td>
<td>0.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>VaB</td>
<td>Visalia sandy loam, 2 to 5 percent slopes</td>
<td>A</td>
<td>0.6</td>
<td>9.1%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td><strong>6.6</strong></td>
<td></td>
<td></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
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
### Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Runoff Coefficient “C”</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% IMPER.</td>
<td>A</td>
</tr>
<tr>
<td>Undisturbed Natural Terrain (Natural)</td>
<td>0*</td>
<td>0.20</td>
</tr>
<tr>
<td>Low Density Residential (LDR)</td>
<td>10</td>
<td>0.27</td>
</tr>
<tr>
<td>Low Density Residential (LDR)</td>
<td>20</td>
<td>0.34</td>
</tr>
<tr>
<td>Low Density Residential (LDR)</td>
<td>25</td>
<td>0.38</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>30</td>
<td>0.41</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>40</td>
<td>0.48</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>45</td>
<td>0.52</td>
</tr>
<tr>
<td>Medium Density Residential (MDR)</td>
<td>50</td>
<td>0.55</td>
</tr>
<tr>
<td>High Density Residential (HDR)</td>
<td>65</td>
<td>0.66</td>
</tr>
<tr>
<td>High Density Residential (HDR)</td>
<td>80</td>
<td>0.76</td>
</tr>
<tr>
<td>Commercial/Industrial (N. Com)</td>
<td>80</td>
<td>0.76</td>
</tr>
<tr>
<td>Commercial/Industrial (G. Com)</td>
<td>85</td>
<td>0.80</td>
</tr>
<tr>
<td>Commercial/Industrial (O.P. Com)</td>
<td>90</td>
<td>0.83</td>
</tr>
<tr>
<td>Commercial/Industrial (Limited I.)</td>
<td>90</td>
<td>0.83</td>
</tr>
<tr>
<td>Commercial/Industrial (General I.)</td>
<td>95</td>
<td>0.87</td>
</tr>
</tbody>
</table>

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, \(C_p\), for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre
NRCS = National Resources Conservation Service
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 85% of the 24 hr precipitation (not applicable to Desert).

3. Plot 6 hr precipitation on the right side of the chart.

4. Draw a line through the point parallel to the plotted lines.

5. This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency __ year
(b) P₆ = _____ in., P₂₄ = _____, \( \frac{P₆}{P₂₄} = _____ \) (2)
(c) Adjusted \( P₆^{(2)} = _____ \) in.
(d) \( tₓ = _____ \) min.
(e) \( I = _____ \) in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.
EXAMPLE:
Given: Watercourse Distance \((D) = 70\) Feet
Slope \((s) = 1.3\)%
Runoff Coefficient \((C) = 0.41\)
Overland Flow Time \((T) = 9.5\) Minutes

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

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Rational Formula - Overland Time of Flow Nomograph
Computation of Effective Slope for Natural Watersheds

Area “A” = Area “B”
Appendix B: 100-Year Pre-Project Condition Hydrologic Output
FILE NAME: C:\AES2016\PRE.DAT
TIME/DATE OF STUDY: 13:58 10/11/2020

-------------------------------------------------------------------
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-------------------------------------------------------------------
2003 SAN DIEGO MANUAL CRITERIA
USER SPECIFIED STORM EVENT (YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.750
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*

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

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

>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
INITIAL SUBAREA FLOW-LENGTH(_FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 1426.50
DOWNSTREAM ELEVATION (FEET) = 1407.00
ELEVATION DIFFERENCE (FEET) = 19.50
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.684
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.4%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.193
SUBAREA RUNOFF (CFS) = 0.25
TOTAL AREA (ACRES) = 0.10 TOTAL RUNOFF (CFS) = 0.25

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

>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
ELEVATION DATA: UPSTREAM (FEET) = 1407.00 DOWNSTREAM (FEET) = 1379.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 70.00 CHANNEL SLOPE = 0.4000
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.727
CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 0.59
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.84
AVERAGE FLOW DEPTH (FEET) = 0.03 TRAVEL TIME (MIN.) = 0.63
Tc (MIN.) = 7.32
SUBAREA AREA (ACRES) = 0.30 SUBAREA RUNOFF (CFS) = 0.70
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 0.4 PEAK FLOW RATE (CFS) = 0.93

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.03 FLOW VELOCITY (FEET/SEC.) = 2.09
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 170.00 FEET.

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

ELEVATION DATA: UPSTREAM (FEET) = 1379.00 DOWNSTREAM (FEET) = 1333.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 415.00 CHANNEL SLOPE = 0.1108
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.901
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.90
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.82
AVERAGE FLOW DEPTH (FEET) = 0.06 TRAVEL TIME (MIN.) = 3.80
Tc (MIN.) = 11.12
SUBAREA AREA (ACRES) = 1.10 SUBAREA RUNOFF (CFS) = 1.95
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 1.5 PEAK FLOW RATE (CFS) = 2.66

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.07 FLOW VELOCITY (FEET/SEC.) = 2.09
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 585.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 41

ELEVATION DATA: UPSTREAM (FEET) = 1333.00 DOWNSTREAM (FEET) = 1322.00
FLOW LENGTH (FEET) = 385.00 MANNING’S N = 0.013
ASSUME FULL-FLOWING PIPELINE
PIPE FLOW VELOCITY (FEET/SEC.) = 54.09
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIECE CROSS SECTION AREA)
GIVEN PIPE DIAMETER (INCH) = 3.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 2.66
PIPE TRAVEL TIME (MIN.) = 0.12 Tc (MIN.) = 11.24
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 970.00 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.) = 11.24
RAINFALL INTENSITY (INCH/HR) = 5.86
TOTAL STREAM AREA (ACRES) = 1.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 2.66

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

CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = 0.3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
INITIAL SUBAREA FLOW LENGTH (FEET) = 75.00
UPSTREAM ELEVATION (FEET) = 1416.80
DOWNSTREAM ELEVATION (FEET) = 1400.00
ELEVATION DIFFERENCE (FEET) = 16.80
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.789
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.4%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.989
SUBAREA RUNOFF (CFS) = 0.27
TOTAL AREA (ACRES) = 0.10
TOTAL RUNOFF (CFS) = 0.27

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 51

>> COMPUTE TRAPEZOIDAL CHANNEL FLOW

ELEVATION DATA: UPSTREAM (FEET) = 1400.00 DOWNSTREAM (FEET) = 1380.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 50.00
CHANNEL SLOPE = 0.4000
CHANNEL BASE (FEET) = 10.00
"Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035
MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.630
CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = 0.3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 0.53
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 2.20
AVERAGE FLOW DEPTH (FEET) = 0.02
TRAVEL TIME (MIN.) = 0.38
Tc (MIN.) = 6.17
SUBAREA AREA (ACRES) = 0.20
SUBAREA RUNOFF (CFS) = 0.52
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 0.3
PEAK FLOW RATE (CFS) = 0.78

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.03
FLOW VELOCITY (FEET/SEC.) = 2.20
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 125.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 104.00 IS CODE = 51

>> COMPUTE TRAPEZOIDAL CHANNEL FLOW

ELEVATION DATA: UPSTREAM (FEET) = 1380.00 DOWNSTREAM (FEET) = 1322.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 545.00  CHANNEL SLOPE = 0.0164
CHANNEL BASE (FEET) = 10.00  "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035  MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 5.743
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.75
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.67
AVERAGE FLOW DEPTH (FEET) = 0.06  TRAVEL TIME (MIN.) = 5.43
Tc (MIN.) = 11.60
SUBAREA AREA (ACRES) = 1.10  SUBAREA RUNOFF (CFS) = 1.90
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 1.4  PEAK FLOW RATE (CFS) = 2.41

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.07  FLOW VELOCITY (FEET/SEC.) = 1.90
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 104.00 = 670.00 FEET.

******************************************************************************
FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 1
-----------------------------------------------------------------------------
>>>>> DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <<<<<
>>>>> AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES <<<<<
============================================================================
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 11.60
RAINFALL INTENSITY (INCH/HR) = 5.74
TOTAL STREAM AREA (ACRES) = 1.40
PEAK FLOW RATE (CFS) AT CONFLUENCE = 2.41

** CONFLUENCE DATA **
STREAM       RUNOFF     Tc      INTENSITY     AREA
NUMBER   (CFS)  (MIN.)  (INCH/HOUR)  (ACRE)
  1    2.66   11.24        5.860         1.50
  2    2.41   11.60        5.743         1.40

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

** PEAK FLOW RATE TABLE **
STREAM       RUNOFF     Tc      INTENSITY
NUMBER   (CFS)  (MIN.)  (INCH/HOUR)
  1    4.99   11.24        5.860
  2    5.01   11.60        5.743

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 5.01  Tc (MIN.) = 11.60
TOTAL AREA (ACRES) = 2.9
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 970.00 FEET.

******************************************************************************
FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 41
-----------------------------------------------------------------------------
>>>>> COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA <<<<<
>>>>> USING USER-SPECIFIED PIPE SIZE (EXISTING ELEMENT) <<<<<
============================================================================
ELEVATION DATA: UPSTREAM (FEET) = 1322.00  DOWNSTREAM (FEET) = 1311.62
FLOW LENGTH (FEET) = 20.00  MANNING'S N = 0.024
DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.4 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 15.15
GIVEN PIPE DIAMETER (INCH) = 18.00  NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 5.01
PIPE TRAVEL TIME (MIN.) = 0.02  Tc (MIN.) = 11.62
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 990.00 FEET.

******************************************************************************
FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 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.) = 11.62
RAINFALL INTENSITY (INCH/HR) = 5.74
TOTAL STREAM AREA (ACRES) = 2.90
PEAK FLOW RATE (CFS) AT CONFLUENCE = 5.01
******************************************************************************
FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21
----------------------------------------------------------------------------
>>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<<<
============================================================================
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
INITIAL SUBAREA LENGTH (FEET) = 125.00
UPSTREAM ELEVATION (FEET) = 1373.00
DOWNSTREAM ELEVATION (FEET) = 1344.00
ELEVATION DIFFERENCE (FEET) = 29.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.684
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.193
SUBAREA RUNOFF (CFS) = 0.25
TOTAL AREA (ACRES) = 0.10  TOTAL RUNOFF (CFS) = 0.25
******************************************************************************
FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 51
----------------------------------------------------------------------------
>>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW <<<<<
>>>> TRAVEL TIME THRU SUBAREA (EXISTING ELEMENT) <<<<<
============================================================================
ELEVATION DATA: UPSTREAM (FEET) = 1344.00  DOWNSTREAM (FEET) = 1324.50
CHANNEL LENGTH THRU SUBAREA (FEET) = 240.00  CHANNEL SLOPE = 0.0812
CHANNEL BASE (FEET) = 10.00  "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015  MAXIMUM DEPTH (FEET) = 0.50
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.109
GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8100
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 94
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.08
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 2.43
AVERAGE FLOW DEPTH (FEET) = 0.03  TRAVEL TIME (MIN.) = 1.64
Tc (MIN.) = 8.33
SUBAREA AREA (ACRES) = 0.30  SUBAREA RUNOFF (CFS) = 1.73
AREA-AVERAGE RUNOFF COEFFICIENT = 0.683
TOTAL AREA (ACRES) = 0.4  PEAK FLOW RATE (CFS) = 1.94
END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.04  FLOW VELOCITY (FEET/SEC.) = 3.17
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 365.00 FEET.
FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 61

>>>><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><<
TOTAL STREAM AREA (ACRES) = 0.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 2.43

FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 51

FLOW PROCESS FROM NODE 132.00 TO NODE 105.00 IS CODE = 61

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

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = 0.3600
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 76
INITIAL SUBAREA FLOW LENGTH (FEET) = 85.00
UPSTREAM ELEVATION (FEET) = 1348.00
DOWNSTREAM ELEVATION (FEET) = 1340.00
ELEVATION DIFFERENCE (FEET) = 8.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.817
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.961
SUBAREA RUNOFF (CFS) = 0.32
TOTAL AREA (ACRES) = 0.10 TOTAL RUNOFF (CFS) = 0.32

FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 51

COMPUTE TRAPEZOIDAL CHANNEL FLOW

ELEVATION DATA: UPSTREAM (FEET) = 1340.00 DOWNSTREAM (FEET) = 1322.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 190.00 CHANNEL SLOPE = 0.0947
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH (FEET) = 0.50
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.287
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = 0.4200
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.09
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.44
AVERAGE FLOW DEPTH (FEET) = 0.05 TRAVEL TIME (MIN.) = 2.20
Tc (MIN.) = 8.02
SUBAREA AREA (ACRES) = 0.50 SUBAREA RUNOFF (CFS) = 1.53
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA (ACRES) = 0.6 PEAK FLOW RATE (CFS) = 1.79

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.06 FLOW VELOCITY (FEET/SEC.) = 1.72
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 275.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 105.00 IS CODE = 61

COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA

UPSTREAM ELEVATION (FEET) = 1322.00 DOWNSTREAM ELEVATION (FEET) = 1319.80
STREET LENGTH (FEET) = 70.00 CURB HEIGHT (INCHES) = 6.0
STREET HALFWIDTH (FEET) = 63.00
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 40.00
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) = 0.0180
Appendix C: 100-Year Post-Project Condition Hydrologic Output
 Clarke Vet and Dental Clinics Post-Project (unmitigated)
COMPUTE TRAPEZOIDAL CHANNEL FLOW

ELEVATION DATA: UPSTREAM(Feet) = 1407.00 DOWNSTREAM(Feet) = 1379.00
CHANNEL LENGTH THRU SUBAREA(Feet) = 70.00 CHANNEL SLOPE = 0.4000
CHANNEL BASE(Feet) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(Feet) = 1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.727
CHAPARRAL(BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.59
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.84
AVERAGE FLOW DEPTH(Feet) = 0.03 TRAVEL TIME(MIN.) = 0.63
Tc(MIN.) = 7.32
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 0.70
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 170.00 FEET.

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(Feet) = 0.03 FLOW VELOCITY(FEET/SEC.) = 2.09
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 170.00 FEET.

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

COMPUTE TRAPEZOIDAL CHANNEL FLOW

ELEVATION DATA: UPSTREAM(Feet) = 1379.00 DOWNSTREAM(Feet) = 1337.00
CHANNEL LENGTH THRU SUBAREA(Feet) = 335.00 CHANNEL SLOPE = 0.1254
CHANNEL BASE(Feet) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(Feet) = 1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.162
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.66
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.81
AVERAGE FLOW DEPTH(Feet) = 0.06 TRAVEL TIME(MIN.) = 3.08
Tc(MIN.) = 10.40
SUBAREA AREA(ACRES) = 0.80 SUBAREA RUNOFF(CFS) = 1.48
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA(ACRES) = 1.2 PEAK FLOW RATE(CFS) = 2.22

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(Feet) = 0.07 FLOW VELOCITY(FEET/SEC.) = 2.04
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 505.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 41

COMPUTE PIPE FLOW TRAVEL TIME THRU SUBAREA

ELEVATION DATA: UPSTREAM(Feet) = 1333.00 DOWNSTREAM(Feet) = 1318.00
FLOW LENGTH(Feet) = 233.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 1.42 INCHES
PIPE FLOW VELOCITY(FEET/SEC.) = 9.15
GIVEN PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE FLOW(CFS) = 2.22
PIPE TRAVEL TIME(MIN.) = 0.42 Tc(MIN.) = 10.82
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 738.00 FEET.
FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 10

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

FLOW PROCESS FROM NODE 150.00 TO NODE 151.00 IS CODE = 22

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 1.54
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 1.54

FLOW PROCESS FROM NODE 151.00 TO NODE 152.00 IS CODE = 31

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 2.31
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 2.31

FLOW PROCESS FROM NODE 152.00 TO NODE 152.00 IS CODE = 1

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 2.31
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 2.31

FLOW PROCESS FROM NODE 150.00 TO NODE 152.00 IS CODE = 22

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 2.31
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 2.31

FLOW PROCESS FROM NODE 152.00 TO NODE 152.00 IS CODE = 1
** CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.54</td>
<td>5.16</td>
<td>9.685</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>2.31</td>
<td>5.00</td>
<td>9.880</td>
<td>0.30</td>
</tr>
</tbody>
</table>

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

** PEAK FLOW RATE TABLE **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.81</td>
<td>5.00</td>
<td>9.800</td>
</tr>
<tr>
<td>2</td>
<td>3.81</td>
<td>5.16</td>
<td>9.685</td>
</tr>
</tbody>
</table>

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

- PEAK FLOW RATE (CFS) = 3.81
- Tc (MIN.) = 5.16
- TOTAL AREA (ACRES) = 0.5
- LONGEST FLOWPATH FROM NODE 150.00 TO NODE 152.00 = 215.00 FEET.

FLOW PROCESS FROM NODE 152.00 TO NODE 154.00 IS CODE = 31

** RATIONAL METHOD INITIAL SUBAREA ANALYSIS **

ELEVATION DATA: UPSTREAM (FEET) = 1323.60 DOWNSTREAM (FEET) = 1322.35

- FLOW LENGTH (FEET) = 75.00
- MANNING'S N = 0.013
- ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
- DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.7 INCHES
- PIPE FLOW VELOCITY (FEET/SEC.) = 6.34
- ESTIMATED PIPE DIAMETER (INCH) = 18.00
- NUMBER OF PIPES = 1
- PIPE FLOW (CFS) = 3.81
- PIPE TRAVEL TIME (MIN.) = 0.20
- Tc (MIN.) = 5.35
- LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 290.00 FEET.

FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

** RATIONAL METHOD INITIAL SUBAREA ANALYSIS **

- TOTAL NUMBER OF STREAMS = 2
- CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
  - TIME OF CONCENTRATION (MIN.) = 5.35
  - RAINFALL INTENSITY (INCH/HR) = 9.45
  - TOTAL STREAM AREA (ACRES) = 0.50
  - PEAK FLOW RATE (CFS) AT CONFLUENCE = 3.81

FLOW PROCESS FROM NODE 160.00 TO NODE 161.00 IS CODE = 22

RATIONAL METHOD INITIAL SUBAREA ANALYSIS...
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 1.54
TOTAL AREA(ACRES) = 0.20  TOTAL RUNOFF(CFS) = 1.54

FLOW PROCESS FROM NODE 161.00 TO NODE 154.00 IS CODE = 31

FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.40
RAINFALL INTENSITY(INCH/HR) = 9.41
TOTAL STREAM AREA(ACRES) = 0.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.54

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER  (CFS)  (MIN.) (INCH/HOUR)  (ACRE)
1 3.81 5.35 9.453 0.50
2 1.54 5.40 9.407 0.20

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 5.34 5.35 9.453
2 5.33 5.40 9.407

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 5.34  Tc(MIN.) = 5.35
TOTAL AREA(ACRES) = 0.7
LONGEST FLOWPATH FROM NODE 160.00 TO NODE 154.00 = 10098.00 FEET.
ELEVATION DATA: UPSTREAM(Feet) = 1322.35 DOWNSTREAM(Feet) = 1321.80
FLOW LENGTH(Feet) = 55.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.4 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 5.74
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.34
PIPE TRAVEL TIME(MIN.) = 0.16 Tc(MIN.) = 5.51
LONGEST FLOWPATH FROM NODE 160.00 TO NODE 132.00 = 10153.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 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.) = 5.51
RAINFALL INTENSITY(INCH/HR) = 9.28
TOTAL STREAM AREA(ACRES) = 0.70
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.34

FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 22

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 1.54
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 1.54

FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(Feet) = 1333.10 DOWNSTREAM(Feet) = 1321.80
FLOW LENGTH(Feet) = 135.00 MANNING'S N = 0.013
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.) = 8.68
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.54
PIPE TRAVEL TIME(MIN.) = 0.26 Tc(MIN.) = 5.26
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 242.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 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.) = 5.26
RAINFALL INTENSITY(INCH/HR) = 9.56
TOTAL STREAM AREA(ACRES) = 0.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.54
FLOW PROCESS FROM NODE 140.00 TO NODE 141.00 IS CODE = 22

RATIONAL METHOD INITIAL SUBAREA ANALYSIS

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 0.77
TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.77

FLOW PROCESS FROM NODE 141.00 TO NODE 132.00 IS CODE = 51

COMPUTE TRAPEZOIDAL CHANNEL FLOW

ELEVATION DATA: UPSTREAM(FEET) = 1338.85 DOWNSTREAM(FEET) = 1326.30
CHANNEL LENGTH THRU SUBAREA(FEET) = 225.00 CHANNEL SLOPE = 0.0558
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.310
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.76
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.44
AVERAGE FLOW DEPTH(FEET) = 0.05 TRAVEL TIME(MIN.) = 1.54
Tc(MIN.) = 6.54
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.94
AREA-AVERAGE RUNOFF COEFFICIENT = 0.780
TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 2.59

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.06 FLOW VELOCITY(FEET/SEC.) = 2.83
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 132.00 = ****** FEET.

TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:
TIME OF CONCENTRATION(MIN.) = 6.54
RAINFALL INTENSITY(INCH/HR) = 8.31
TOTAL STREAM AREA(ACRES) = 0.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.59

** CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.34</td>
<td>5.51</td>
<td>9.276</td>
<td>0.70</td>
</tr>
<tr>
<td>2</td>
<td>1.54</td>
<td>5.26</td>
<td>9.563</td>
<td>0.20</td>
</tr>
<tr>
<td>3</td>
<td>2.59</td>
<td>6.54</td>
<td>8.310</td>
<td>0.40</td>
</tr>
</tbody>
</table>

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 3 STREAMS.
** PEAK FLOW RATE TABLE **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.80</td>
<td>5.26</td>
<td>9.563</td>
</tr>
<tr>
<td>2</td>
<td>9.02</td>
<td>5.51</td>
<td>9.276</td>
</tr>
<tr>
<td>3</td>
<td>8.71</td>
<td>6.54</td>
<td>8.310</td>
</tr>
</tbody>
</table>

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

- PEAK FLOW RATE (CFS) = 9.02
- Tc (MIN.) = 5.51
- TOTAL AREA (ACRES) = 1.3
- LONGEST FLOWPATH FROM NODE 140.00 TO NODE 132.00 = ********** FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 104.00 IS CODE = 31

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 12

** MAIN STREAM CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.02</td>
<td>5.57</td>
<td>9.220</td>
<td>1.30</td>
</tr>
</tbody>
</table>

LONGEST FLOWPATH FROM NODE 140.00 TO NODE 104.00 = ********** FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.22</td>
<td>10.82</td>
<td>6.005</td>
<td>1.20</td>
</tr>
</tbody>
</table>

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 738.00 FEET.

** PEAK FLOW RATE TABLE **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.16</td>
<td>5.57</td>
<td>9.220</td>
</tr>
<tr>
<td>2</td>
<td>8.09</td>
<td>10.82</td>
<td>6.005</td>
</tr>
</tbody>
</table>

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

- PEAK FLOW RATE (CFS) = 10.16
- Tc (MIN.) = 5.57
- TOTAL AREA (ACRES) = 2.5

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 12

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31
COMPUTE PIPE FLOW TRAVEL TIME THRU SUBAREA

ELEVATION DATA: UPSTREAM (FEET) = 1318.00 DOWNSTREAM (FEET) = 1317.00
FLOW LENGTH (FEET) = 100.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.6 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 6.72
ESTIMATED PIPE DIAMETER (INCH) = 21.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 10.16
PIPE TRAVEL TIME (MIN.) = 0.25 Tc (MIN.) = 5.81
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 105.00 = ********** FEET.

ADDITION OF SUBAREA TO MAINLINE PEAK FLOW

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.964
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = 0.7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5585
SUBAREA AREA (ACRES) = 0.10 SUBAREA RUNOFF (CFS) = 0.70
TOTAL AREA (ACRES) = 2.6 TOTAL RUNOFF (CFS) = 13.02
Tc (MIN.) = 5.81

FLOW PROCESS FROM NODE 105.00 TO NODE 123.00 IS CODE = 31

RATIONAL METHOD INITIAL SUBAREA ANALYSIS

CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = 0.3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
INITIAL SUBAREA FLOW LENGTH (FEET) = 75.00
UPSTREAM ELEVATION (FEET) = 1416.80
DOWNSTREAM ELEVATION (FEET) = 1400.00
ELEVATION DIFFERENCE (FEET) = 16.80
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.789
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.989
SUBAREA RUNOFF (CFS) = 0.27
TOTAL AREA (ACRES) = 0.10 TOTAL RUNOFF (CFS) = 0.27

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 51

>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW
>>> TRAVEL TIME THRU SUBAREA (EXISTING ELEMENT)

ELEVATION DATA: UPSTREAM (FEET) = 1400.00 DOWNSTREAM (FEET) = 1380.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 50.00 CHANNEL SLOPE = 0.4000
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.630
CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = 0.3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 0.53
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 2.20
AVERAGE FLOW DEPTH (FEET) = 0.02 TRAVEL TIME (MIN.) = 0.38
Tc (MIN.) = 6.17
SUBAREA AREA (ACRES) = 0.20 SUBAREA RUNOFF (CFS) = 0.52
AREA- AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 0.3 PEAK FLOW RATE (CFS) = 0.78

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.03 FLOW VELOCITY (FEET/SEC.) = 2.20
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 125.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 51

>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW
>>> TRAVEL TIME THRU SUBAREA (EXISTING ELEMENT)

ELEVATION DATA: UPSTREAM (FEET) = 1380.00 DOWNSTREAM (FEET) = 1349.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 235.00 CHANNEL SLOPE = 0.1319
CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.143
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = 0.3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.41
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.86
AVERAGE FLOW DEPTH (FEET) = 0.05 TRAVEL TIME (MIN.) = 2.10
Tc (MIN.) = 8.27
SUBAREA AREA (ACRES) = 0.60 SUBAREA RUNOFF (CFS) = 1.29
AREA- AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 0.9 PEAK FLOW RATE (CFS) = 1.93

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.06 FLOW VELOCITY (FEET/SEC.) = 1.85
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 360.00 FEET.
FLOW LENGTH (FEET) = 290.00  MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.1 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.41
ESTIMATED PIPE DIAMETER (INCH) = 18.00  NUMBER OF PipeS = 1
PIPE-FLOW (CFS) = 1.93
PIPE TRAVEL TIME (MIN.) = 0.51  Tc(MIN.) = 8.78
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 122.00 = 650.00 FEET.

FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 1

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 8.78
RAINFALL INTENSITY (INCH/HR) = 6.87
TOTAL STREAM AREA (ACRES) = 0.90
PEAK FLOW RATE (CFS) AT CONFLUENCE = 1.93

FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21

PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = 0.3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
INITIAL SUBAREA FLOW-LENGTH (FEET) = 125.00
UPSTREAM ELEVATION (FEET) = 1373.00
DOWNSTREAM ELEVATION (FEET) = 1344.00
ELEVATION DIFFERENCE (FEET) = 29.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.684
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.193
SUBAREA RUNOFF (CFS) = 0.25
TOTAL AREA (ACRES) = 0.10  TOTAL RUNOFF (CFS) = 0.25

FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 51

ELEVATION DATA: UPSTREAM (FEET) = 1344.00  DOWNSTREAM (FEET) = 1324.50
CHANNEL LENGTH THRU SUBAREA (FEET) = 240.00  CHANNEL SLOPE = 0.0812
CHANNEL BASE (FEET) = 10.00  "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015  MAXIMUM DEPTH (FEET) = 0.50
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.109
GENERAL COMMERCIAL RUNOFF COEFFICIENT = 0.8100
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 94
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.08
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 2.43
AVERAGE FLOW DEPTH (FEET) = 0.03  TRAVEL TIME (MIN.) = 1.64
Tc(MIN.) = 8.33
SUBAREA AREA (ACRES) = 0.30  SUBAREA RUNOFF (CFS) = 1.73
AREA-AVERAGE RUNOFF COEFFICIENT = 0.683
TOTAL AREA (ACRES) = 0.4  PEAK FLOW RATE (CFS) = 1.94
END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.04  FLOW VELOCITY (FEET/SEC.) = 3.17
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 365.00 FEET.

FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 1

FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 61

FLOW PROCESS FROM NODE 120.00 TO NODE 122.00 IS CODE = 1

FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 61

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION (MIN.) = 8.33
RAINFALL INTENSITY (INCH/HR) = 7.11
TOTAL STREAM AREA (ACRES) = 0.40
PEAK FLOW RATE (CFS) AT CONFLUENCE = 1.94

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 1.93 8.78 6.871 0.90
2 1.94 8.33 7.109 0.40

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 3.77 8.33 7.109
2 3.80 8.78 6.871

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 3.80  Tc (MIN.) = 8.78
TOTAL AREA (ACRES) = 1.3
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 122.00 = 650.00 FEET.

FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 61

UPSTREAM ELEVATION (FEET) = 1324.50  DOWNSTREAM ELEVATION (FEET) = 1321.00
STREET LENGTH (FEET) = 110.00  CURB HEIGHT (INCHES) = 6.0
STREET HALFWIDTH (FEET) = 63.00
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 40.00
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) = 0.0180
Manning’s FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

** TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 4.06
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.28
HALFSTREET FLOOD WIDTH (FEET) = 7.59
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.93
PRODUCT OF DEPTH & VELOCITY (FT*FT/SEC.) = 0.81
STREET FLOW TRAVEL TIME (MIN.) = 0.63  Tc (MIN.) = 9.41
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.572
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = 0.7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.444
SUBAREA AREA (ACRES) = 0.10  SUBAREA RUNOFF (CFS) = 0.51
TOTAL AREA (ACRES) = 1.4  PEAK FLOW RATE (CFS) = 4.08

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.28  HALFSTREET FLOOD WIDTH (FEET) = 7.59
FLOW VELOCITY (FEET/SEC.) = 2.94  DEPTH * VELOCITY (FT * FT/SEC.) = 0.82
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 123.00 = 760.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 11
****************************************************************************

** MAIN STREAM CONfluence DATA **
STREAM  RUNOFF  Tc  INTENSITY  AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1  4.08  9.41  6.572  1.40

LONGEST FLOWPATH FROM NODE 110.00 TO NODE 123.00 = 760.00 FEET.

** MEMORY BANK # 1 CONfluence DATA **
STREAM  RUNOFF  Tc  INTENSITY  AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1  13.02  5.87  8.905  2.60

LONGEST FLOWPATH FROM NODE 140.00 TO NODE 124.00 = ******** FEET.

** PEAK FLOW RATE TABLE **
STREAM  RUNOFF  Tc  INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1  15.56  5.87  8.905
2  13.69  9.41  6.572

COMPUTED CONfluence ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 15.56  Tc (MIN.) = 5.87
TOTAL AREA (ACRES) = 4.0

****************************************************************************
FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 12
****************************************************************************

>>>>>CLEAR MEMORY BANK # 1 <<<<<

****************************************************************************
FLOW PROCESS FROM NODE 123.00 TO NODE 124.00 IS CODE = 41
****************************************************************************

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

ELEVATION DATA: UPSTREAM (FEET) = 1311.84  DOWNSTREAM (FEET) = 1310.12
FLOW LENGTH (FEET) = 68.66  MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 9.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 10.30
GIVEN PIPE DIAMETER (INCH) = 36.00  NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 15.56
PIPE TRAVEL TIME (MIN.) = 0.11  Tc (MIN.) = 5.99
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 124.00 = ******** FEET.
FLOW PROCESS FROM NODE 124.00 TO NODE 124.00 IS CODE = 81

===============================================

ADDITION OF SUBAREA TO MAINLINE PEAK FLOW

100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.798
STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8700
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 98
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5268

SUBAREA AREA (ACRES) = 0.10 SUBAREA RUNOFF (CFS) = 0.77
TOTAL AREA (ACRES) = 4.1 TOTAL RUNOFF (CFS) = 19.00
TC(MIN.) = 5.99

END OF STUDY SUMMARY:
TOTAL AREA (ACRES) = 4.1 TC(MIN.) = 5.99
PEAK FLOW RATE (CFS) = 19.00

END OF RATIONAL METHOD ANALYSIS
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1708

Analysis prepared by:
Wynn Engineering, Inc.
27315 Valley Center Road
Valley Center, CA 92082

FILE NAME: C:\AES2016\POST.DAT
TIME/DATE OF STUDY: 20:09 08/12/2021

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT (YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.750
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 0.0312 0.167 0.0150

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

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

>>> RAATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<

S.C.S. CURVE NUMBER (AMC II) = 75
INITIAL SUBAREA FLOW-LENGTH (FEET) = 100.00
UPSTREAM ELEVATION (FEET) = 1426.50
DOWNSTREAM ELEVATION (FEET) = 1407.00
ELEVATION DIFFERENCE (FEET) = 19.50
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.684
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.193
SUBAREA RUNOFF (CFS) = 0.25
TOTAL AREA (ACRES) = 0.10 TOTAL RUNOFF (CFS) = 0.25

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 51
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) = 1407.00 DOWNSTREAM(FEET) = 1379.00
CHANNEL LENGTH THRU SUBAREA(Feet) = 70.00 CHANNEL SLOPE = 0.4000
CHANNEL BASE(Feet) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(Feet) = 1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.727
CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.59
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/SEC.) = 1.84
AVERAGE FLOW DEPTH(Feet) = 0.03 TRAVEL TIME(MIN.) = 0.63
Tc(MIN.) = 7.32
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 0.70
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 0.93
END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(Feet) = 0.03 FLOW VELOCITY(Feet/SEC.) = 2.09
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 170.00 FEET.
**************************************************************************
FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(Feet) = 1379.00 DOWNSTREAM(Feet) = 1337.00
CHANNEL LENGTH THRU SUBAREA(Feet) = 335.00 CHANNEL SLOPE = 0.1254
CHANNEL BASE(Feet) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(Feet) = 1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.162
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.66
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/SEC.) = 1.81
AVERAGE FLOW DEPTH(Feet) = 0.06 TRAVEL TIME(MIN.) = 3.08
Tc(MIN.) = 10.40
SUBAREA AREA(ACRES) = 0.80 SUBAREA RUNOFF(CFS) = 1.48
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA(ACRES) = 1.2 PEAK FLOW RATE(CFS) = 2.22
END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(Feet) = 0.07 FLOW VELOCITY(Feet/SEC.) = 2.04
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 505.00 FEET.
**************************************************************************
FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 41
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(Feet) = 1333.00 DOWNSTREAM(Feet) = 1318.00
FLOW LENGTH(Feet) = 233.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 4.2 INCHES
PIPE-FLOW VELOCITY(Feet/SEC.) = 9.15
GIVEN PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.22
PIPE TRAVEL TIME(MIN.) = 0.42 Tc(MIN.) = 10.82
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 738.00 FEET.
FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 10

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

FLOW PROCESS FROM NODE 150.00 TO NODE 151.00 IS CODE = 22

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

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 1.54
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 1.54

FLOW PROCESS FROM NODE 151.00 TO NODE 152.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(Feet) = 1333.40 DOWNSTREAM(Feet) = 1323.60
FLOW LENGTH(Feet) = 90.00 MANNING'S N = 0.013
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.) = 9.54
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE FLOW(CFS) = 1.54
PIPE TRAVEL TIME(MIN.) = 0.16 Tc(MIN.) = 5.16
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 152.00 = 215.00 FEET.

FLOW PROCESS FROM NODE 152.00 TO NODE 152.00 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.) = 5.16
RAINFALL INTENSITY(INCH/HR) = 9.68
TOTAL STREAM AREA(ACRES) = 0.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.54

FLOW PROCESS FROM NODE 153.00 TO NODE 152.00 IS CODE = 22

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

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 2.31
TOTAL AREA(ACRES) = 0.30 TOTAL RUNOFF(CFS) = 2.31

FLOW PROCESS FROM NODE 152.00 TO NODE 152.00 IS CODE = 1
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 5.35
RAINFALL INTENSITY (INCH/HR) = 9.45
TOTAL STREAM AREA (ACRES) = 0.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 3.81
** FLOW PROCESS FROM NODE 150.00 TO NODE 154.00 IS CODE = 21
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 215.00 FEET.

ELEVATION DATA: UPSTREAM (FEET) = 1323.60 DOWNSTREAM (FEET) = 1322.35
FLOW LENGTH (FEET) = 75.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.7 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 6.34
ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 3.81
PIPE TRAVEL TIME (MIN.) = 0.20 Tc(MIN.) = 5.35
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 290.00 FEET.

** FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 5.35
RAINFALL INTENSITY (INCH/HR) = 9.45
TOTAL STREAM AREA (ACRES) = 0.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 3.81
** FLOW PROCESS FROM NODE 150.00 TO NODE 154.00 IS CODE = 21
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 215.00 FEET.

ELEVATION DATA: UPSTREAM (FEET) = 1323.60 DOWNSTREAM (FEET) = 1322.35
FLOW LENGTH (FEET) = 75.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.7 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 6.34
ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 3.81
PIPE TRAVEL TIME (MIN.) = 0.20 Tc(MIN.) = 5.35
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 290.00 FEET.

** FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 5.35
RAINFALL INTENSITY (INCH/HR) = 9.45
TOTAL STREAM AREA (ACRES) = 0.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 3.81
** FLOW PROCESS FROM NODE 150.00 TO NODE 154.00 IS CODE = 21
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 215.00 FEET.

ELEVATION DATA: UPSTREAM (FEET) = 1323.60 DOWNSTREAM (FEET) = 1322.35
FLOW LENGTH (FEET) = 75.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.7 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 6.34
ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 3.81
PIPE TRAVEL TIME (MIN.) = 0.20 Tc(MIN.) = 5.35
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 290.00 FEET.

** FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 5.35
RAINFALL INTENSITY (INCH/HR) = 9.45
TOTAL STREAM AREA (ACRES) = 0.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 3.81
** FLOW PROCESS FROM NODE 150.00 TO NODE 154.00 IS CODE = 21
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 215.00 FEET.

ELEVATION DATA: UPSTREAM (FEET) = 1323.60 DOWNSTREAM (FEET) = 1322.35
FLOW LENGTH (FEET) = 75.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.7 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 6.34
ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 3.81
PIPE TRAVEL TIME (MIN.) = 0.20 Tc(MIN.) = 5.35
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 290.00 FEET.

** FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION (MIN.) = 5.35
RAINFALL INTENSITY (INCH/HR) = 9.45
TOTAL STREAM AREA (ACRES) = 0.50
PEAK FLOW RATE (CFS) AT CONFLUENCE = 3.81
** FLOW PROCESS FROM NODE 150.00 TO NODE 154.00 IS CODE = 21
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 215.00 FEET.

ELEVATION DATA: UPSTREAM (FEET) = 1323.60 DOWNSTREAM (FEET) = 1322.35
FLOW LENGTH (FEET) = 75.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 6.7 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 6.34
ESTIMATED PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 3.81
PIPE TRAVEL TIME (MIN.) = 0.20 Tc(MIN.) = 5.35
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 290.00 FEET.
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 1.54
TOTAL AREA(ACRES) = 0.20 TOTAL RUNOFF(CFS) = 1.54

FLOW PROCESS FROM NODE 161.00 TO NODE 154.00 IS CODE = 31

---

FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 1

---

ELEVATION DATA: UPSTREAM(FEET) = 1323.35 DOWNSTREAM(FEET) = 1322.35
FLOW LENGTH(Feet) = 98.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 4.8 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 4.13
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.54
PIPE TRAVEL TIME(MIN.) = 0.40 Tc(MIN.) = 5.40
LONGEST FLOWPATH FROM NODE 160.00 TO NODE 154.00 = 10098.00 FEET.

---

FLOW PROCESS FROM NODE 154.00 TO NODE 132.00 IS CODE = 31
ELEVATION DATA: UPSTREAM(FEET) = 1322.35 DOWNSTREAM(FEET) = 1321.80
FLOW LENGTH (FEET) = 55.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.74
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 5.34
PIPE TRAVEL TIME(MIN.) = 0.16 Tc(MIN.) = 5.51
LONGEST FLOWPATH FROM NODE 160.00 TO NODE 132.00 = 10153.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 1

崁入ạnh diện từ phần còn lại của văn bản.
FLOW PROCESS FROM NODE 140.00 TO NODE 141.00 IS CODE = 22

>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<

NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
USER SPECIFIED Tc(MIN.) = 5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 9.880
SUBAREA RUNOFF(CFS) = 0.77
TOTAL AREA(ACRES) = 0.10  TOTAL RUNOFF(CFS) = 0.77

FLOW PROCESS FROM NODE 141.00 TO NODE 132.00 IS CODE = 51

>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW <<<

ELEVATION DATA: UPSTREAM(FEET) = 1338.85  DOWNSTREAM(FEET) = 1326.30
CHANNEL LENGTH THRU SUBAREA(FEET) = 225.00  CHANNEL SLOPE = 0.0558
CHANNEL BASE(FEET) = 10.00  "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015  MAXIMUM DEPTH(FEET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.310
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.76
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.44
AVERAGE FLOW DEPTH(FEET) = 0.05  TRAVEL TIME(MIN.) = 1.54
Tc(MIN.) = 6.54
SUBAREA AREA(ACRES) = 0.30  SUBAREA RUNOFF(CFS) = 1.94
AREA-AVERAGE RUNOFF COEFFICIENT = 0.780
TOTAL AREA(ACRES) = 0.4  PEAK FLOW RATE(CFS) = 2.59

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPHT(FEET) = 0.06  FLOW VELOCITY(FEET/SEC.) = 2.83
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 132.00 = ********** FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 1

>>> DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE <<<

TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 3 ARE:
TIME OF CONCENTRATION(MIN.) = 6.54
RAINFALL INTENSITY(INCH/HR) = 8.31
TOTAL STREAM AREA(ACRES) = 0.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.59

** CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.34</td>
<td>5.51</td>
<td>9.276</td>
<td>0.70</td>
</tr>
<tr>
<td>2</td>
<td>1.54</td>
<td>5.26</td>
<td>9.563</td>
<td>0.20</td>
</tr>
<tr>
<td>3</td>
<td>2.59</td>
<td>6.54</td>
<td>8.310</td>
<td>0.40</td>
</tr>
</tbody>
</table>

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 3 STREAMS.
** PEAK FLOW RATE TABLE **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8.80</td>
<td>5.26</td>
<td>9.563</td>
</tr>
<tr>
<td>2</td>
<td>9.02</td>
<td>5.51</td>
<td>9.276</td>
</tr>
<tr>
<td>3</td>
<td>8.71</td>
<td>6.54</td>
<td>8.310</td>
</tr>
</tbody>
</table>

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 9.02  Tc (MIN.) = 5.51
TOTAL AREA (ACRES) = 1.3
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 132.00 = ********** FEET.

******************************************************************************
FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 7

** PEAK FLOW RATE TABLE **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.73</td>
<td>10.82</td>
<td>6.005</td>
</tr>
</tbody>
</table>

******************************************************************************
FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 7

********************** USER SPECIFIED HYDROLOGY INFORMATION AT NODE **********************

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 12.00  RAIN INTENSITY (INCH/HOUR) = 5.62
TOTAL AREA (ACRES) = 1.30  TOTAL RUNOFF (CFS) = 2.80

VALUES FROM HYDRAFLOW DETENTION ANALYSIS

TC CALCULATED FROM INFLOW TC PLUS PEAK ATTENUATION
(12 MIN) FROM DETENTION ANALYSIS

******************************************************************************
FLOW PROCESS FROM NODE 132.00 TO NODE 104.00 IS CODE = 31

********************** USER SPECIFIED HYDROLOGY INFORMATION AT NODE **********************

ELEVATION DATA: UPSTREAM (FEET) = 1318.20  DOWNSTREAM (FEET) = 1318.00
FLOW LENGTH (FEET) = 20.00  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.) = 4.85
ESTIMATED PIPE DIAMETER (INCH) = 18.00  NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 2.80
PIPE TRAVEL TIME (MIN.) = 0.07  Tc (MIN.) = 12.07
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 104.00 = ********** FEET.

******************************************************************************
FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 11

********************** CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY **********************

** MAIN STREAM CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.80</td>
<td>12.07</td>
<td>5.597</td>
<td>1.30</td>
</tr>
</tbody>
</table>

LONGEST FLOWPATH FROM NODE 140.00 TO NODE 104.00 = ********** FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.22</td>
<td>10.82</td>
<td>6.005</td>
<td>1.20</td>
</tr>
</tbody>
</table>

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 738.00 FEET.

** PEAK FLOW RATE TABLE **

<table>
<thead>
<tr>
<th>STREAM NUMBER</th>
<th>RUNOFF (CFS)</th>
<th>Tc (MIN.)</th>
<th>INTENSITY (INCH/HOUR)</th>
<th>AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.73</td>
<td>10.82</td>
<td>6.005</td>
<td></td>
</tr>
</tbody>
</table>
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 4.87  Tc(MIN.) = 12.07
TOTAL AREA (ACRES) = 2.5

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 12

FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

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

FLOW PROCESS FROM NODE 105.00 TO NODE 123.00 IS CODE = 31

FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 10

Clarke Vet and Dental Clinics Post-Project (Mitigated)
FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

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

CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
INITIAL SUBAREA FLOW-LENGTH (FEET) = 75.00
UPSTREAM ELEVATION (FEET) = 1416.80
DOWNSTREAM ELEVATION (FEET) = 1400.00
ELEVATION DIFFERENCE (FEET) = 16.80
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 5.789
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.989
SUBAREA RUNOFF (CFS) = 0.27
TOTAL AREA (ACRES) = 0.10
TOTAL RUNOFF (CFS) = 0.27

FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM (FEET) = 1400.00  DOWNSTREAM (FEET) = 1380.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 50.00  CHANNEL SLOPE = 0.4000
CHANNEL BASE (FEET) = 10.00  "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035  MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.630
CHAPARRAL (BROADLEAF) FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 75
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 0.53
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 2.20
AVERAGE FLOW DEPTH (FEET) = 0.02  TRAVEL TIME (MIN.) = 0.38
Tc (MIN.) = 6.17
SUBAREA AREA (ACRES) = 0.20  SUBAREA RUNOFF (CFS) = 0.52
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 0.3  PEAK FLOW RATE (CFS) = 0.78
END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.03  FLOW VELOCITY (FEET/SEC.) = 2.20
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 125.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 51

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

ELEVATION DATA: UPSTREAM (FEET) = 1380.00  DOWNSTREAM (FEET) = 1349.00
CHANNEL LENGTH THRU SUBAREA (FEET) = 235.00  CHANNEL SLOPE = 0.1319
CHANNEL BASE (FEET) = 10.00  "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.035  MAXIMUM DEPTH (FEET) = 1.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 7.143
PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 1.41
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) = 1.86
AVERAGE FLOW DEPTH (FEET) = 0.05  TRAVEL TIME (MIN.) = 2.10
Tc (MIN.) = 8.27
SUBAREA AREA (ACRES) = 0.60  SUBAREA RUNOFF (CFS) = 1.29
AREA-AVERAGE RUNOFF COEFFICIENT = 0.300
TOTAL AREA (ACRES) = 0.9  PEAK FLOW RATE (CFS) = 1.93

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH (FEET) = 0.06  FLOW VELOCITY (FEET/SEC.) = 1.85
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 113.00 = 360.00 FEET.

FLOW PROCESS FROM NODE 113.00 TO NODE 122.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM (FEET) = 1349.00  DOWNSTREAM (FEET) = 1323.80
FLOW LENGTH (FEET) = 290.00  MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER (INCH) INCREASED TO 18.000
DEPTH OF FLOW IN 18.0 INCH PIPE IS 3.1 INCHES
PIPE FLOW VELOCITY (FEET/SEC.) = 9.41
ESTIMATED PIPE DIAMETER (INCH) = 18.00  NUMBER OF PIPES = 1
PIPE FLOW (CFS) = 1.93
PIPE TRAVEL TIME (MIN.) = 0.51  Tc (MIN.) = 8.78
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 122.00 = 650.00 FEET.

FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 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.) = 8.78
RAINFALL INTENSITY (INCH/HR) = 6.87
TOTAL STREAM AREA (ACRES) = 0.90
PEAK FLOW RATE (CFS) AT CONFLUENCE = 1.93

FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21

>>> RATIONAL METHOD INITIAL SUBAREA ANALYSIS <<<

PERENNIAL GRASS FAIR COVER RUNOFF COEFFICIENT = .3000
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 79
INITIAL SUBAREA FLOW LENGTH (FEET) = 125.00
UPSTREAM ELEVATION (FEET) = 1373.00
DOWNSTREAM ELEVATION (FEET) = 1344.00
ELEVATION DIFFERENCE (FEET) = 29.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) = 6.684
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 100.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 8.193
SUBAREA RUNOFF (CFS) = 0.25
TOTAL AREA (ACRES) = 0.10  TOTAL RUNOFF (CFS) = 0.25

FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 51

>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW <<<
>>> TRAVEL TIME THRU SUBAREA (EXISTING ELEMENT) <<<
ELEVATION DATA: UPSTREAM(FEET) = 1344.00 DOWNSTREAM(FEET) = 1324.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 240.00 CHANNEL SLOPE = 0.0812
CHANNEL BASE(FeET) = 10.00 "Z" FACTOR = 99.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FeET) = 0.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.109
GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8100
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 94
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.08
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FeET/SEC.) = 2.43
AVERAGE FLOW DEPTH(FeET) = 0.03 TRAVEL TIME(MIN.) = 1.64
Tc(MIN.) = 8.33
SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.73
AREA-AVERAGE RUNOFF COEFFICIENT = 0.683
TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 1.94

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FeET) = 0.04 FLOW VELOCITY(FeET/SEC.) = 3.17
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 365.00 FEET.

*****************************************************************************
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 = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 8.33
RAINFALL INTENSITY(INCH/HOUR) = 7.11
TOTAL STREAM AREA(ACRES) = 0.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.94

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 1.93 8.78 6.871 0.90
2 1.94 8.33 7.109 0.40

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 3.77 8.33 7.109
2 3.80 8.78 6.871

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 3.80 Tc(MIN.) = 8.78
TOTAL AREA(ACRES) = 1.3
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 122.00 = 650.00 FEET.

*****************************************************************************
FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 61
---------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FeET) = 1324.50 DOWNSTREAM ELEVATION(FeET) = 1321.00
STREET LENGTH(FeET) = 110.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FeET) = 63.00
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 40.00
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 FRICITION FACTOR for Streetflow Section (curb-to-curb) = 0.0180
Manning's FRICITION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 4.06**
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH (FEET) = 0.28
HALFSTREET FLOOD WIDTH (FEET) = 7.59
AVERAGE FLOW VELOCITY (FEET/SEC.) = 2.93
PRODUCT OF DEPTH & VELOCITY (FT*FT/SEC.) = 0.81
STREET FLOW TRAVEL TIME (MIN.) = 0.63  Tc (MIN.) = 9.41
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 6.572
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = 0.7800
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 93
AREA-AVERAGE RUNOFF COEFFICIENT = 0.444
SUBAREA AREA (ACRES) = 0.10  SUBAREA RUNOFF (CFS) = 0.51
TOTAL AREA (ACRES) = 1.4  PEAK FLOW RATE (CFS) = 4.08

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH (FEET) = 0.28  HALFSTREET FLOOD WIDTH (FEET) = 7.59
FLOW VELOCITY (FEET/SEC.) = 2.94  DEPTH*VELOCITY (FT*FT/SEC.) = 0.82
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 123.00 = 760.00 FEET.

** MAIN STREAM CONFLUENCE DATA **
STREAM  RUNOFF  Tc  INTENSITY  AREA
NUMBER   (CFS)  (MIN.)  (INCH/HOUR)  (ACRE)
1        4.08     9.41       6.572        1.40
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 123.00 = 760.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **
STREAM  RUNOFF  Tc  INTENSITY  AREA
NUMBER   (CFS)  (MIN.)  (INCH/HOUR)  (ACRE)
1        5.16    12.44       5.488        2.60
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 123.00 = ******* FEET.

** PEAK FLOW RATE TABLE **
STREAM  RUNOFF  Tc  INTENSITY
NUMBER   (CFS)  (MIN.)  (INCH/HOUR)
1        7.98     9.41       6.572
2        8.57     12.44       5.488

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE (CFS) = 8.57  Tc (MIN.) = 12.44
TOTAL AREA (ACRES) = 4.0

FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 12

---------------------------------------------------------------------
>>>

Clarke Vet and Dental Clinics Post-Project (Mitigated)
Page 13 of 14
FLOW PROCESS FROM NODE 123.00 TO NODE 124.00 IS CODE = 41

FLOW LENGTH(FEET) = 68.66  MANNING'S N = 0.013
DEPTH OF FLOW IN 36.0 INCH PIPE IS 7.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.66
GIVEN PIPE DIAMETER(INCH) = 36.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.57
PIPE TRAVEL TIME(MIN.) = 0.13  Tc(MIN.) = 12.58
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 124.00 = ********** FEET.

FLOW PROCESS FROM NODE 124.00 TO NODE 124.00 IS CODE = 81

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.450
STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8700
SOIL CLASSIFICATION IS "C"
S.C.S. CURVE NUMBER (AMC II) = 98
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4011
SUBAREA AREA(ACRES) = 0.10  SUBAREA RUNOFF(CFS) = 0.47
TOTAL AREA(ACRES) = 4.1  TOTAL RUNOFF(CFS) = 8.96
Tc(MIN.) = 12.58

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 4.1  TC(MIN.) = 12.58
PEAK FLOW RATE(CFS) = 8.96

END OF RATIONAL METHOD ANALYSIS
### Rational Method Hydrograph Program

**Copyright 1992, 2001 Rick Engineering Company**

- **Run Date:** 8/12/2021
- **Hydrograph File Name:** Text1
- **Time of Concentration:** 6 min.
- **6 Hour Rainfall:** 3.75 inches
- **Basin Area:** 1.3 acres
- **Runoff Coefficient:** 0.78
- **Peak Discharge:** 9 CFS

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Watershed Model Schematic

Legend

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Project: Basin100.gpw

Friday, 08 / 13 / 2021
## Hydrograph Return Period Recap

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<th>Hyd. No.</th>
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<th>Inflow hyd(s)</th>
<th>Peak Outflow (cfs)</th>
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Proj. file: Basin100.gpw

Friday, 08 / 13 / 2021
<table>
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<th>Hyd. No.</th>
<th>Hydrograph type (origin)</th>
<th>Peak flow (cfs)</th>
<th>Time interval (min)</th>
<th>Time to Peak (min)</th>
<th>Hyd. volume (cuft)</th>
<th>Inflow hyd(s)</th>
<th>Maximum elevation (ft)</th>
<th>Total strge used (cuft)</th>
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Hyd. No. 1

LID-1

Hydrograph type = Manual
Storm frequency = 100 yrs
Time interval = 6 min

Peak discharge = 9,000 cfs
Time to peak = 246 min
Hyd. volume = 10,656 cuft

---

LID-1
Hyd. No. 1 -- 100 Year

Q (cfs)

10.00
8.00
6.00
4.00
2.00
0.00

0.00 36 72 108 144 180 216 252

Time (min)

Q (cfs)

Hyd No. 1
# Hydrograph Report

**Hyd. No. 2**

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<td>Hyd. volume</td>
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<td>Max. Elevation</td>
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<td>Max. Storage</td>
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Storage Indication method used.

---

Hyd. No. 2 -- 100 Year

Q (cfs)

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Total storage used = 3,985 cuft
Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 1323.10 ft

Stage / Storage Table

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<th>Stage (ft)</th>
<th>Elevation (ft)</th>
<th>Contour area (sqft)</th>
<th>Incr. Storage (cuft)</th>
<th>Total storage (cuft)</th>
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Culvert / Orifice Structures

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<th>[A]</th>
<th>[B]</th>
<th>[C]</th>
<th>[PrfRsR]</th>
<th>Crest Len (ft)</th>
<th>[A]</th>
<th>[B]</th>
<th>[C]</th>
<th>[D]</th>
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<tr>
<td>Span (in)</td>
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<td>Weir Type</td>
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Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge

Note: Stage / Discharge is graphed with stage on the y-axis and discharge (cfs) on the x-axis. The graph shows the relationship between stage and discharge for the pond.
## Intensity-Duration-Frequency Equation Coefficients (FHA)

<table>
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<th>Return Period (Yrs)</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>(N/A)</th>
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File name: SampleFHA.idf

### Intensity Values (in/hr)

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Tc = time in minutes. Values may exceed 60.

## Rainfall Precipitation Table (in)

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