Appendix I Utilities and Hydrology Data

From: Elliott, Terri [telliott@surfcity-hb.org]
Sent: Thursday, July 03, 2008 11:29 AM
To: Thomas, Ruta K
Cc: Nguyen, Tess
Subject: FW: Capacity reviews for new development projects in City of Huntington Beach

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From: Chenowith, Bob [mailto:BCHENOWITH@OCSD.COM]
Sent: Tuesday, June 24, 2008 12:16 PM
To: Nazaroff, Adam
Cc: Allison, Wendy; Elliott, Terri; Bogart, Steve; Burror, Jim; Linder, John
Subject: RE: Capacity reviews for new development projects in City of Huntington Beach

Adam/City of HB:

Thanks for the email here is my response since we have capacity in the proposed OCSD trunk sewers:

OCSD does not give "Will serve letters" but we will allow new connection permits to up size existing OCSD manhole
stubs and we may allow a new connection depending on the existing conditions of the existing manhole and since
OCSD staff has confirmed OCSD has no capacity issues for the proposed connection locations.

Connection to existing OCSD 15" sewer at Goldenwest Ave. and Heil Ave.
Rip Curl Development – There is an existing manhole at the intersection of Heil Ave. & Goldenwest Ave. OCSD
Contract no. 11- 3, sta. 52 + 80.92 that shows a permit connection to the City of HB (11-198) that increased the
existing manhole stub from an 8" to a 12" connection for a proposed 12" City of HB sewer going east on Heil Ave.

Connection to existing OCSD 69" trunk sewer at Old Hoover
Option connection/ increasing existing connection 10" to a 12" and adding a new 12" connection at the intersection of
Center Ave. and Old Hoover Street OCSD Contract no. 3-2 sta. 472 + 50.94 shows an existing manhole on the existing
69" OCSD trunk sewer but OCSD does not show a City of HB permit for the existing 10" City sewer connecting from the
shopping center? If you want to increase the existing stub to a 12" that is not a problem but adding another 12" may be
a problem but will have to be field verified before approval is given. The City and OCSD will have to field verify the existing
condition of the manhole to see if it may need some upgraded modifications and also verify if the manhole will allow another connection. OCSD will require a permit connection for both connections and the City will have to sign the permits and be
the applicant for the projects.

Note OCSD will require inspection fees to be paid when the permits are obtained. OCSD inspection fees will be determined
When the plans are submitted for review and approved. If you have any other questions please feel free to give me a call.

Robert L. Chenowith
Senior Engineering Associate
Planning/Engineering Division
Orange County Sanitation District
Phone: 714-593-7318
Fax: 714-962-5018

From: Nazaroff, Adam
Sent: Monday, June 23, 2008 4:06 PM
To: 'sbogart@surfcity-hb.org'
Cc: Chenowith, Bob; Allison, Wendy
Subject: FW: Capacity reviews for new development projects in City of Huntington Beach

Steve,

-Montomery Ward Re-Development – OCSD year 2030 wet weather peak flow model indicates that there is around 4 mgd capacity on our 69 inch sewer at Edinger (where you wish to re-connect). Regarding your request to upsize the existing connection from a 10" to 12", please contact Bob Chenowith @ 714-593-7318.

-Rip Curl Development – 69inch – same answer as above. Golden West from Edinger to Heil- OCSD year 2030 wet weather peak flow model indicates that there is around .6 mgd capacity on our 12/15 inch sewer.

Thanks,

Adam

From: Bogart, Steve [mailto:sbogart@surfcity-hb.org]
Sent: Wednesday, June 18, 2008 3:06 PM
To: Nazaroff, Adam
Cc: Elliott, Terri; Nguyen, Tess
Subject: Capacity reviews for new development projects in City of Huntington Beach

Good Afternoon, Adam:

I am a civil engineer with the City of Huntington Beach Department of Public Works. We currently have two proposed development projects (Bella Terra Phase II and Ripcurl) in the City that are in the environmental review process. The preparing company of the draft EIRs, PBS&J, is required by the City to include written confirmation in the EIRs that the downstream OCSD sewer trunk lines and treatment plant have adequate capacity for the proposed project flows and that the proposed connection points to OCSD sewer trunk lines is acceptable.

For further information on the aforementioned projects please see the attached letters. The letter regarding the Bella Terra Phase Ii project was already sent to Mr. Robert Ghirelli.

PBS&j is nearing publishing of the subject EIRs (possibly by the end of this week). Any expediting of your review of the attached request letters would be greatly appreciated.

Sincerely,

Steven Bogart, PE - Senior Civil Engineer
City of Huntington Beach - Dept. of Public Works
2000 Main Street, Huntington Beach, CA 92648
Voice - 714. 536.5431
Fax - 714.374.1573

City of Huntington Beach

Wet Utilities Study

For

The Ripcurl

Project

July 2008

Prepared by:

12301 Wilshire Boulevard, Suite 430
Los Angeles, CA 90025
310.268.8132

1.0 Introduction

The purpose of this Wet Utilities Study is to provide information related to water, wastewater, and stormwater infrastructure anticipated to serve The Ripcurl Project (proposed project). This review of infrastructure and infrastructure capacity is summarized in Table 1-1. Results of this Study will be incorporated into other environmental documents as necessary, including but not limited to the Environmental Impact Report (EIR).

Table 1-1: Utility Evaluation Summary

Utility		Project Impact	Evaluation Result
Water	Supply	Net increase in demand of 53 acre-ft/year.	Sufficient water supply is available.
	Capacity	128 gpm design flow rate 4000 gpm fire flows	Sufficiency determined by City hydraulic analysis. Private on-site pipes need to be sized to meet peak fire flows and daily flow rates.
Wastewater	Conveyance/ Volume Rate	Increase peak hourly flows by 30.7 gpm with total peak hour flows of 62.5 gpm.	All wastewater flows to an 8" VCP with a design capacity of 125 gpm. Applicant shall perform a baseline capacity analysis of existing sewer to ensure adequate capacity.
	Treatment	Project will be served by OCSD, no stated capacity limitations.	The City has approached OCSD for interceptor and treatment capacity assurance. OCSD has confirmed that there is capacity in the existing trunk sewer located in Goldenwest Street at Heil Avenue.
Stormwater	Volume/Rate	No net increase in exceedence of stormwater conveyance capacity; existing system already exceeded.	Existing system capacity is already exceeded for the 10-year and 25-year storm events. On-site attenuation required.
	Quality	No substantial increase in pollutant loads or concentrations.	This NPDES Permit Priority Project requires a WQMP with Site Design, Source Control (routine structural and routine non-structural), and Treatment Control BMPs. The Preliminary WQMP follows DAMP template/requirements and includes StormFilter™ for treatment. New off-site, piped storm drain system in Gothard Street to Edinger Avenue required for treated flow.

2.0 Project Description

The proposed project is located at 7302-7400 Center Avenue in the northeastern portion of the City of Huntington Beach in western Orange County, California. The proposed project is located within a developed 3.8-acre site bordered by Center Avenue to the north; an existing commercial property to the south; Gothard Street to the west; and the Union Pacific Railroad (UPRR) right-of-way, commercial property, and the proposed Village at Bella Terra site to the east.

The proposed project is a mixed-use residential and commercial development that would consist of four levels of housing over three levels of parking (two levels of parking below grade and one level of parking above grade). The retail component would be located on the ground level adjacent to the two levels of above grade parking. A mezzanine level would also be located on the roof. Overall, the project would be six stories in height and consist of approximately 440 residential units and up to 10,000 square feet (sf) of commercial uses, including up to 3,000 sf of restaurant use. The total project floor area, excluding parking and basement area, would be approximately 382,700 sf.

The residential component would include approximately 301,098 sf of residential area and approximately 7,000 sf of leasing office, lobby and recreation space. Of the approximately 440 residential units that are proposed, it is estimated that 151 would be studio apartments, 190 would be one-bedroom units, 88 would be two-bedroom units, and 11 would be live-work loft units. Units would range in size from 465 sf (studio) to 1,037 sf (two-bedroom). Based on the existing average household size of 2.41 persons per renter-occupied unit for the City of Huntington Beach, the residential component of the project could generate approximately 1,060 residents. However, based on the Applicant's experience with similar projects, the residential component of the project would most likely generate approximately 660 residents for an average density of 1.5 persons per dwelling unit (DU), which is based on an average household size of 1.2 persons per studio and loft units, 1.5 persons per one-bedroom unit, 2.2 persons per two-bedroom unit, and 1.2 persons per live-work loft.

The commercial component of the proposed project would include up to 10,000 sf of ground floor retail, including up to 3,000 sf of restaurant, and would be located on the corner of Gothard Street and Center Avenue. The commercial component would offer neighborhood-serving retail that would target students attending Golden West College and nearby residents. Potential retailers would include uses such as a convenience store, café, sandwich shop, cleaners, juice shop, and mailbox store.

Project buildout is assumed to occur between 2010 and 2015 for the purposes of this analysis.

3.0 Water

3.1 Water Supply

The City of Huntington Beach provides potable water to the City and the Sunset Beach area of unincorporated Orange County and would serve the proposed project. The City obtains potable water from two sources: imported water and groundwater. In addition to these identified water supply sources, it is with aggressive water conservation and efficient water use that will continue to allow the City to provide reliable service to its customers.

3.1.1 Imported Water

The City is a member of the Municipal Water District of Orange County (MWDOC). MWDOC wholesales imported water to the City from Metropolitan Water District of Southern California (Metropolitan). The City receives imported water through three connections to the Metropolitan system, which have a total capacity of 22,000 gallons per minute (gpm).[1] One connection (OC-9) enters Huntington Beach at Newland Street and Edinger Avenue, and has the capacity to deliver 6,300 gpm into the water system. [2] The second connection (OC-35) is located at Springdale Street and Glenwood Drive with a capacity of 9,000 gpm. The third connection (OC-44) enters Huntington Beach at the Santa Ana River and Adams Avenue with a capacity of 6,700 gpm.[3]

The City also maintains four potable water storage reservoirs with a combined capacity of 55 million gallons (MG). Pumps draw water from the reservoirs and pressurize it into the water system during high demand periods.[4] Overmyer Reservoir has a capacity of approximately 20 MG. Peck Reservoir has a capacity of approximately 17 MG. Edwards Hill Reservoir has a capacity of 9 MG. Springdale Reservoir has a capacity of approximately 9 MG.[5]

3.1.2 Groundwater

The City is a member of Orange County Water District (OCWD), which manages the regional groundwater basin. As a member, the City is entitled to produce groundwater from the Orange County Groundwater Basin.

Within the City, groundwater for potable use is produced from 10 operating wells currently in use that vary in depth from 306 feet to 996 feet, with production ranging from 500 gpm to 3,400 gpm. Total system capacity is 25,050 gpm.[6]

3.1.3 Water Conservation and Efficient Use

Significant progress has been made in water conservation and efficient use over recent years. A number of conservation efforts are underway on the state-wide, regional, and local levels to further reduce water use. In a February 2008 press release from Governor Schwarzenegger regarding the Delta Vision Blue Ribbon Task Force, the Governor identified a plan under development to achieve a 20 percent reduction

[1] City of Huntington Beach. Water Master Plan. 2005 p. 3-10.

[2] City of Huntington Beach. Water Master Plan. 2005 p. 3-10.

[3] City of Huntington Beach. Water Master Plan. 2005. p. 3-10.

[4] City of Huntington Beach. Urban Water Management Plan. 2005. p. 2-4.

[5] EIP Associates. Newland Street Residential Project. Water Supply and Wastewater TR. December 2005. p. 5.

[6] City of Huntington Beach. Urban Water Management Plan. 2005. p. 2-8.

in per capita water use statewide by 2020.[7] This plan encourages a more aggressive approach including the implementation of additional legislation.

In response to the Governor's February 2008 press release, Timothy F. Brick, chairman of the board of directors of Metropolitan issued a statement including the following: "In Metropolitan's six-county service area, per-capita water use has declined dramatically since 1990, allowing the region to meet its current water needs with the same amount of imported water used nearly 20 years ago, even though our population has grown by more than 4 million. While urban Southern California is ahead of most other regions of the state, an approach that identifies local opportunities and creates incentives to promote conservation would be particularly effective."[8]

An example of Metropolitan's promotion of conservation is the "Cut Your Water Use" Ad campaign, which marks the first time Metropolitan has specifically directed consumers to reduce their landscape irrigation. The 13-week conservation ad campaign is aimed at customers to reduce their water use by cutting outdoor watering by at least one day a week. The campaign will reach out to customers through a variety of media including television, radio, print, and on-line ads.[9]

On behalf of its member agencies, MWDOC's Water Use Efficiency Department administers programs to encourage the public to reduce their water use in the residential, commercial, industrial, and institutional sectors. A number of rebate programs offer consumer's financial incentives to reduce their water use including home appliance, synthetic turf, and landscape rebates. MWDOC also participates in public outreach through school education programs and the California Friendly Landscape Training Program. MWDOC's Water Use Efficiency Program follows three basic goals:

1. Provide on-going water use efficiency program support for member agencies.

2. Assume the position of lead agency to implement water use efficiency programs that are more cost-effectively implemented on a regional basis than on a local basis.

3. Secure outside funding from Metropolitan's Conservation Credits Program, United States Bureau of Reclamation, and other sources.

On August 21, 2000, the City became Signatory to the Memorandum of Understanding (MOU) regarding Best Management Practices (BMP's) for Urban Water Conservation within the California Urban Water Conservation Council (CUWCC). The CUWCC has established 14 cost-effective BMP's including rebate programs, conservation programs, education and information programs, etc. The City has been committed towards the implementation of these BMPs and its efforts are documented in Activity Reports.

Although the legislature recently declared the water supply to be a limited resource and a statewide concern, it is at the local level that water reliability and availability is best accomplished through aggressive water conservation and efficient use of the urban water supplies. Further, it is through public education about water conservation and efficient water use methods that will ensure a reliable source of water supply to accommodate the City's existing and future customers.

3.1.4 Future Water Supplies

Poseidon Resources Corporation has proposed a Seawater Desalination Project located in the City of Huntington Beach. The project would provide Orange County residents with an additional 50 million gallons per day (MGD) of drought-resistant water supply. A contractual agreement is in place for the City of Huntington Beach to receive 5 cubic feet per second (cfs) under normal conditions, equating to about 9 percent of the City's current average demand. The project has met major milestones including the EIR

[7] Office of the Governor, Press Release (February 29, 2008)

[8] Metropolitan Water District of Southern California, News Release (February 29, 2008)

[9] Water District of Southern California, News Release (April 17, 2008)

certified by the City Council on September 6, 2005. The Seawater Desalination Project is expected to be on-line by 2011.

3.2 Water Demand

3.2.1 Accounted Demand

The City of Huntington Beach prepared an analysis of accounted for water. The analysis, included in a letter dated in May 19, 2008, is in Appendix A. The property was originally zoned as commercial and was projected to have a 1,480 gallons per day per acre (gpd/acre) demand factor.[10] Based on 3.8 acres, it is assumed that the UWMP planned for an annual demand of 6 acre-ft per year (AFY).

3.2.2 Proposed Demand

Based upon current information available to the City, the number of proposed dwelling units, the size of the commercial portion of the development alternatives submitted, the City and State conservation and water efficiency objectives, the following demand factors were used to estimate water demand for the proposed project. Water Demand for the proposed project for water supply analysis is presented in Table 3-1.

- **Residential:** maximum of 70 gallons per capita per day (gpcd)
- **Restaurant:** 1.5 gallons per day per square foot (gpd/sf)
- **Commercial:** 0.15 gallons per day per square foot (gpd/sf)
- **Aggressive Drought Tolerant Landscaping:** 0.01 gallons per day per square foot (gpd/sf).

Table 3-1: Water Demand for the Proposed Project for Water Supply Analysis

Land Use	Proposed Amount	Capita per DU	Demand Factor	Water Demand (gpd)	Water Demand (AFY)
Residential - studio apts	151 DU	1.2	70 gpcd	12,684	14
Residential - 1 bedroom	190 DU	1.5	70 gpcd	19,950	22
Residential - 2 bedroom	88 DU	2.2	70 gpcd	13,552	15
Residential - live-work lofts	11 DU	1.2	70 gpcd	924	1
Residential TOTAL	***440 DU***	***1.5***	***70 gpcd***	***47,110***	***52***
Offices	7,000 sf		0.15 gpd/sf	1,050	1
Commercial/Restaurant	3,000 sf		1.5 gpd/sf	4,500	5
Commercial/Retail	7,000 sf		0.15 gpd/sf	1,050	1
Irrigation	0.55 acre		0.01 gpd/sf	240	0
Total Demand				**53,950**	**59**

Note: Values have been rounded to nearest whole number; totals may not add up due to rounding.
Source: PBS&J and Appendix A.

For infrastructure sizing, sometimes higher demand factors are used to be conservative. The demand factors used for conveyance and capacity determinations are included in Table 3-5 (Section 3.3 Water Conveyance and Capacity Determination).

[10] City of Huntington Beach. Water Master Plan. 2005. Table 2-7.

3.2.3 Net Increase in Demand

The net increase in water demand is the difference between demand on the project site accounted for in the 2005 Urban Water Management Plan and any additional demand required by implementation of the proposed project (see Table 3-1). As stated in Section 3.2.1, 6 AFY was accounted for in the 2005 UWMP; as such, a net increase of approximately 53 AFY has been estimated by City of Huntington Beach and in this report.

3.2.4 Supply Demand Comparison

The projected water supplies and demands in normal, single dry, and multiple dry years are presented in Table 3-2, Table 3-3, and Table 3-4, respectively. The supply and base demand figures are taken from the 2005 UWMP. The committed demand represents water already made available for other developments in the City that were not included in the supply and demand analysis in the 2005 UWMP. Projected demands in dry years fluctuate to reflect climatic variation specific to each dry year scenario.

Table 3-2: Supply Demand Comparison for the Proposed Project in Normal Years

Normal Year	2010	2015	2020	2025	2030
Supply					
MWDOC Imported	13,620	13,320	14,170	13,470	12,780
Groundwater	24,300	24,540	24,790	25,040	25,260
Total Supply	**37,920**	**37,860**	**38,960**	**38,510**	**38,040**
Demand					
2005 UWMP Demand	34,710	35,060	35,410	35,770	36,090
Committed Demand[a]	600	600	600	600	600
The Ripcurl Net Increase	53	53	53	53	53
Total Demand	**35,363**	**35,713**	**36,063**	**36,423**	**36,743**
Supply/Demand Difference	**2,557**	**2,147**	**2,897**	**2,087**	**1,297**

Source: City of Huntington Beach 2005 Urban Water Management Plan, p. 4-19.
All units are AFY
[a]City of Huntington Beach letter dated May 19, 2008. See Appendix A.

Table 3-3: Supply Demand Comparison for the Proposed Project in Single Dry Years

Single Dry Year	2010	2015	2020	2025	2030
Supply					
MWDOC Imported	12,900	13,870	14,260	13,480	12,920
Groundwater	25,630	25,890	26,150	26,420	26,650
Total Supply	**38,530**	**39,760**	**40,410**	**39,900**	**39,570**
Demand					
2005 UWMP Demand	36,620	36,990	37,360	37,740	38,070
Committed Demand[a]	600	600	600	600	600
The Ripcurl Net Increase	53	53	53	53	53
Total Demand	**37,273**	**37,643**	**38,013**	**38,393**	**38,723**
Supply/Demand Difference	**1,257**	**2,117**	**2,397**	**1,507**	**847**

Source: City of Huntington Beach 2005 Urban Water Management Plan, p. 4-20.
All units are AFY
. [a]City of Huntington Beach letter dated May 19, 2008. See Appendix A.

The 2028, 2029, and 2030 multiple dry year sequence was provided in the Hunsaker and Associates (2008b) report since it represents the multiple dry year sequence in which the least amount of surplus water is available.

Table 3-4: Supply Demand Comparison for the Proposed Project in Multiple Dry Years

	Normal Years		Multiple Dry Years		
	2026	2027	2028	2029	2030
Supply					
MWDOC Imported	13,340	13,190	13,370	13,230	13,090
Groundwater	25,080	25,130	26,860	26,150	26,650
Total Supply	**38,420**	**38,320**	**40,230**	**39,380**	**39,740**
Demand					
2005 UWMP Demand	35,830	35,900	38,370	37,360	38,070
Committed Demand[a]	600	600	600	600	600
The Ripcurl Net Increase	53	53	53	53	53
Total Demand	**36,483**	**36,553**	**39,023**	**38,013**	**38,723**
Supply/Demand Difference	**1,937**	**1,767**	**1,207**	**1,367**	**1,017**

Source: Hunsaker and Associates Irvine, Inc. Water Supply Assessment and Water Supply Verification For Bella Terra II. May 6, 2008.
All units are AFY
[a]City of Huntington Beach letter dated May 19, 2008. See Appendix A.

3.2.5 Water Supply Determination

This supply and demand balance, based on the 2005 UWMP, shows that the City of Huntington Beach has an adequate supply of water to serve both the projected and existing customers of the City. Further, the supply and demand analysis found that the total water supplies available to the City during normal, single dry and multiple dry years within a 20-year projection will meet the estimated water demand of The Ripcurl development, in addition to the demand of existing and other known, planned future uses.

A December 2007 federal court order imposed interim pumping restrictions on State Water Project (SWP) operations in the Sacramento-San Joaquin Delta (Delta). U.S. District Judge Oliver Wanger's decision was made to address protection of the threatened Delta smelt. The pumping restrictions reduce the amount of future imported water supplies available to Southern California and eliminate the delivery of replenishment water (In-Lieu Program) indefinitely. Preliminary estimates predict that Metropolitan Water District of Southern California could lose up to 30 percent of its Delta supplies as a result of this decision. The interim pumping restrictions will remain in effect until a new biological opinion is due in September 2008; however, water supply issues will remain and plans to address the Delta's problems are in progress.

The conclusion of sufficient supply does not address the potential 30 percent reduction of imported water; however, the City's conservation programs and statewide efforts are targeting increased water efficiency and conservation of over 20 percent as discussed in section 3.1.3. The conservation and efficiency efforts will increase the supply reliability.

Additionally, water-saving features in residential units could reduce inside residential water demand factors by about 35 percent. The goal of the City is to aim for an inside water use demand factor of 45 gpcd for new projects. Therefore, in addition to City water conservation and educational programs, the following project conditions of approval are recommended:

<u>Recommended Project Conditions of Approval</u>:

- Waterless urinals in the commercial and restaurant areas
- Ultra low-flush toilets in the residential units
- Low-flow shower heads and faucet aerators in the residential units
- Aggressive drought tolerant landscape design with the option to use artificial turf
- Efficient irrigation including smart irrigation controllers and separate irrigation meters
- Ultra water-efficient clothes washers and other appliances in common areas and residential units
- Incentives for new residents to purchase ultra water-efficient appliances

- Provide signs throughout the proposed project site to wisely use water
- Make available resources to residents and tenants on how to use water efficiently

3.3 Water Conveyance and Capacity Determination

Water conveyance and capacity were evaluated with the City's hydraulic water model. The City's model verified whether the City's existing off-site water infrastructure has sufficient conveyance capacity to meet domestic and fire flow demands for the proposed project. On-site water exhibits for the proposed project were provided by Fuscoe Engineering (Appendix B).

The demand factors for the capacity analysis are based on design average flow with some demand factors varying from those used for the water supply analysis. Conservative demand factors are used for the capacity analysis to ensure adequate pipe sizing meets both domestic and fire flows. Based on the demand factors listed below, the proposed development would have a total design average demand of 128.5 gpm for 3.8 acres of the residential, commercial retail, and office uses. Modeled proposed project domestic demand factors and fire flow distribution results are summarized in Table 3-5.

Table 3-5: Design Average Domestic Demand and Fire Flow Distribution for Water Conveyance and Capacity Analysis

Land Use	Quantity	Demand Factor[a]	Total Demand (gpm)	No. of Locations	Demand per Location (gpm)
Domestic Demand Distribution					
Condominiums	440 DU	400 gpd/DU	122.2	1	122.2
Commercial/Office	7,000 sf	0.3 gpd/sf	1.5	1	1.5
Commercial/Restaurant	3,000 sf	1.5 gpd/sf	3.1	1	3.1
Commercial/Retail	7,000 sf	0.3 gpd/sf	1.5	1	1.5
Landscaping	23,773 sf	0.01 gpd/sf	0.2	1	0.2
Total			**128.5**	**1**	**128.5**
Fire Flow Distribution					
N/A	**N/A**	**N/A**	**4,000**	**3**	**1,300 or 1,400**

Source: Fuscoe Engineering, **The Ripcurl Onsite Water Exhibit**, approved May 20, 2008. See Appendix B.
[a] The demand factors for capacity analysis are based on peak flow vary from those used for supply analysis

Fire flow demands placed at three proposed fire hydrants were evaluated using the City's hydraulic water model with a total fire flow demand of 4,000 gpm. The modeled static pressures dropped from 70 and 68 pounds per square inch (psi) to 60 and 58 psi, respectively, with pressure readings recorded at each point of connection described below. Since residual water pressures meet City of Huntington Beach Fire Department requirements, and modeled results satisfy Water Standards design requirements, the City has determined there is sufficient conveyance capacity to meet domestic water and fire flow demands of the proposed project. The model results and the Applicant's exhibits are provided in Appendix B (approved by the City on May 20, 2008). Private, on-site new pipelines and appurtenances are required; however, no off-site improvements to the existing infrastructure located within the public right-of-way are required.

4.0 Wastewater

The City owns, operates, and maintains a wastewater collection system that includes gravity pipelines, manholes, lift stations and force mains. This system serves over 95 percent of the areas within the City,

and several small areas within the cities of Westminster, Seal Beach, Newport Beach, and Fountain Valley. The City's wastewater system would provide service to the proposed project.[11]

4.1 Sewer Conveyance and Capacity

4.1.1 City Collection System

The City's collection system is comprised of approximately 385 miles of wastewater pipelines ranging in size from 6 to 30 inches in diameter. Approximately 85 percent of the City's wastewater pipelines are 8 inches in diameter. Due to the City's generally flat conditions, the City also operates and maintains 28 lift stations ranging in capacity from approximately 80 gallons per minute to 1,350 gallons per minute. These facilities lift sewage from low points in the collection system to manholes at higher locations.[12,13]

The City's local system generally discharges to larger Orange County Sanitation District (OCSD) facilities to convey wastewater to the local treatment plant. Given the growth within OCSD's service area, OCSD is currently upsizing a number of collection system pipelines to provide additional capacity.

4.1.2 Orange County Sanitation District Collection System

OCSD is responsible for receiving, treating, and disposing of the wastewater generated in central and northwest Orange County, including the City's wastewater. In this regional management capacity, OCSD owns, operates and maintains the majority of the "backbone" wastewater collection trunk pipelines. The sewer system consists of 12 trunk sewer systems ranging in size from 12 to 96 inches in diameter and collectively over 500 miles long. Additionally, there are 39 sewer interconnections and 87 diversions to maximize conveyance of flows through the system. Twenty pump stations are used to pump sewage from lower lying areas to the treatment plants.[14]

No existing capacity issues have been identified, and OCSD has developed engineering plans for plant improvements anticipated to meet area demands to the year 2050.[15] OCSD has confirmed that there is capacity in the existing 15-inch sewer at Goldenwest Street and Heil Avenue. As an alternative, the 69-inch sewer in the Old Hoover alignment at Center Avenue also has capacity for the proposed project. The City of Huntington Beach has a 12-inch connection at the intersection of Goldenwest Street and Heil Avenue.

4.1.3 Existing Wastewater Generation

Based on commercial land use for the entire 3.8-acre project site, the existing wastewater generation is about 33,106 gallons per day (gpd) with a peak flow rate of 31.8 gpm.[16] Water used for irrigation is not considered in this wastewater analysis.

4.1.4 Proposed Wastewater Generation

The proposed project estimated wastewater generation rates are listed in Table 4-1- Estimated Sewer Flows for the proposed project, below.

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[11] City of Huntington Beach. Citywide Sewer Master Plan. p. 3.2

[12] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-1.

[13] City of Huntington Beach. Citywide Sewer Master Plan. p. 1.1.

[14] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-1.

[15] EIP Associates, Pacific City Environmental Impact Report. 2003. p. 3.15-3.

[16] Where demand factor is 0.2 gallons per day per square foot and peak flow rate = $1.78(Q_{avg})$^0.92; City of Huntington Beach May 7, 2008.

Table 4-1: Estimated Sewer Flows for the Proposed Project

Land Use	Quantity	Demand Factor[a]	Estimated Flow
Residential	440 DU	140 gpd/DU	61,600 gpd
Commercial/Office	7,000 sf	0.2 gpd/sf	1,400 gpd
Commercial/Restaurant	3,000 sf	1.5 gpd/sf	4,500 gpd
Commercial/Retail	7,000 sf	0.2 gpd/sf	1,400 gpd
Total			**68,900 gpd**
Total			**47.8 gpm**
Peak Hourly Discharge	**$1.78(Q_{avg})$^0.92**		**62.5 gpm**

Notes:
DU = dwelling unit, SF = square feet; gpd = gallons per day; MGD = million gallons per day; Q = discharge; avg = average.
[a]Source: City of Huntington Beach May 7, 2008.

Flow factors used in Table 4-1 are for sewer facilities sizing and will exceed the actual demand factors used for water use.

4.1.5 Net Increase in Wastewater Generation

The net increase in wastewater generation is the difference between existing generation on the project site (see Section 4.1.3) and generation because of the proposed project (see Table 4-1). The proposed project would, therefore, result in a net increase of 35,794 gpd average daily flow and 30.7 gpm peak hourly discharges.

4.1.6 Conveyance Capacity

Nearest to the proposed project site, an 8-inch VCP pipeline runs south along Gothard Street. The proposed project will convey wastewater to this sewer line. The Applicant will be required to provide a capacity evaluation of the local sewer line. If the existing infrastructure is determined to be inadequate for the proposed development, new and/or upgraded sewer lines would be constructed as part of The Ripcurl development in order to serve the anticipated uses. Installation of these lines would occur during the construction of the wastewater collection systems and would adhere to existing laws and regulations; the infrastructure would be sized appropriately for the future development. The OCSD does not issue “will serve letters”; however, they have run a 2030 wet weather peak flow model and determined that there is about 0.6 MGD capacity in the 15-inch sewer line at Goldenwest Street and Heil Avenue and 4 MGD in the 69-inch sewer line at Center Avenue and the Old Hoover alignment, which may serve as an alternate connection to serve the proposed project if the Gothard or Heil Avenue systems are impacted.[17]

4.2 Wastewater Treatment

Wastewater from the City’s service area is collected and treated by OCSD. OCSD has two operating facilities that treat wastewater from residential, commercial and industrial sources in central and northwest Orange County. OCSD’s Reclamation Plant No. 1 is located in the City of Fountain Valley about four miles northeast of the ocean and adjacent to the Santa Ana River. The plant provides advanced primary and secondary treatment through an activated sludge system. The secondary effluent is either blended with the advanced primary effluent and routed to the ocean disposal system, or is sent to the Orange County Water District facilities for advanced treatment and recycling.[18]

Treatment Plant No. 2 is located in the City of Huntington Beach adjacent to the Santa Ana River and about 1,500 feet from the ocean. This plant provides a mix of advanced primary and secondary treatment.

[17] OCSD. Email dated June 23, 2008 from Adam Nazaroff (OCSD) to Steve Bogart (City of Huntington Beach). Capacity Reviews for New Development Project in City of Huntington Beach.

[18] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-2.

The plant receives raw wastewater through five major sewers. Approximately 33 percent of the influent receives secondary treatment through an activated sludge system, and all of the effluent is discharged into the ocean disposal system. OCSD's treated wastewater is discharged through a 120-inch outfall at a depth of about 200 feet below sea level and nearly five miles offshore from the mouth of the Santa Ana River.[19]

The proposed project's wastewater flows would be treated by Reclamation Plant No. 1.[20] Current maximum treatment capacity for Reclamation Plant No. 1 is 218 million gallons per day (MGD); on average, the plant treats approximately 120 MGD.[21] The plant is currently designed to provide primary treatment to 218 MGD of wastewater and secondary treatment to 110 MGD. The primary treatment system will be increased to a design capacity of 198 MGD during the current discharge permit term.[22] However, Reclamation Plant No. 1 is currently unable to treat all average daily flows to secondary treatment levels and there are no plans to expand the secondary treatment system.

The quantities of wastewater are generally proportional to the population and water use in the service area. Wastewater generated by the City in 2005 was approximately 21 MGD. By 2030, wastewater generated by the City is expected to increase to nearly 26 MGD.[23]

4.2.1 Wastewater Treatment Plant Capacity

Remaining capacity at Reclamation Plant No. 1 is 98 MGD. Remaining capacity at Treatment Plant No. 2 is approximately 24 MGD.[24] As such, it is assumed there would be more than adequate capacity to treat the net increase of 35,794 gpd (0.036 MGD) of wastewater that would be generated by the proposed project. OCSD has stated that there is adequate capacity for the proposed project.[25]

[19] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-2.

[20] Bob Chenoweth. City of Huntington Beach. Engineering Department. Personal communication. June 9, 2008. (714) 962-2411

[21] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-2.

[22] California Regional Water Quality Control Board. Santa Ana Region. Waste Discharge Requirements for Orange County Sanitation District's Reclamation Plant No. 1 and Treatment Plant No. 2, Order No. R8-2004-0062, NPDES Permit No. CA0110604.

[23] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-3.

[24] City of Huntington Beach. Urban Water Management Plan. 2005. p. 8-3.

[25] OCSD. Email dated June 23, 2008 from Adam Nazaroff (OCSD) to Steve Bogart (City of Huntington Beach). Capacity Reviews for New Development Project in City of Huntington Beach.

5.0 Stormwater

5.1 Stormwater Conveyance System

The City is responsible for its own subregional and local drainage facilities, which ultimately route runoff into Orange County Flood Control District (OCFCD) facilities. The City's stormwater system would provide service to the proposed project.

The City owns, operates, and maintains approximately 131 miles of storm drainage system for the purpose of conveying storm runoff so as to reduce or eliminate flooding under peak storm flow conditions. The storm drainage system begins with the streets and roads, and includes inlets, storm drains, open channels, pump stations, detention basins, and other appurtenances. Because of the topographic nature of the City, the City operates 15 pump stations, generally located near principal County of Orange drainage channels. The runoff waters are collected at each pump station site through the City's drainage facilities, and then lifted up to the nearest County of Orange channel, which ultimately conveys the floodwaters from the City to the Pacific Ocean.[26] There are three lakes within the City boundaries that can serve as temporary detention basins in flood conditions: Huntington Lake, Talbert Lake and Sully-Miller Lake.[27]

The City's channels, originally designed to accommodate up to 25-year flood events, are constructed at ground level, or at-grade. The at-grade channels accelerate flooding potential because the amount of water that may be pumped into an at-grade channel is less than what can be pumped to a below grade channel. As a result, those areas located adjacent to an at-grade channel can flood in a storm event because the pump stations are unable to pump a sufficient amount of water into the channels.[28]

The Orange County Flood Control District (OCFCD) is responsible for the design, construction, operation, and maintenance of regional flood control facilities. OCFCD owns and/or maintains approximately 18 miles of storm drain systems within the City. County-owned and maintained channels found in the City include the CO-2 (Bolsa Chica), CO-4 (Westminster), CO-5 (East Garden Grove-Wintersburg), CO-6 (Oceanview), CO-7 (Sunset), DO-1 (Huntington Beach), DO-2 (Talbert) channel, DO-5 (Fountain Valley) channel, and the EO-1 channel (Santa Ana River).[29] These channels receive runoff from areas within the City as well as substantial drainage areas in other upstream jurisdictions. It is estimated that runoff from the City makes up about 35-40 percent of the total dry and wet weather flows in the channels. Additionally, the County owns and maintains a storm drain pump station located at the head of the DO-1 channel.[30]

Only the eastern-most portion of the City is adjacent to, and uses, the Santa Ana River Channel, built and operated by the U.S. Army Corps of Engineers. Two City pump stations and a private outlet make use of the Santa Ana River Channel facility.[31]

The Drainage Element of the Citywide Urban Runoff Management Plan (CHB 2005) incorporates a City-based Master Plan of Drainage (MPD) that is a comprehensive drainage study of the community, which identifies and creates an inventory of existing storm drain facilities, identifies those areas where system elements do not meet the latest goals established by the City, ranks the severity of the difference between existing capacity and the capacity needed to achieve those goals, prepares planning level cost

[26] EIP Associates. Newland Street Residential Project. Hydrology and Water Quality Technical Report. December 2005. p 6.

[27] City of Huntington Beach. Citywide Urban Runoff Management Plan. 2005. p. 4-5.

[28] EIP Associates. Newland Street Residential Project. Hydrology and Water Quality Technical Report. December 2005. p 6.

[29] City of Huntington Beach. Citywide Urban Runoff Management Plan. 2005. p. 4-5 through 4-7.

[30] City of Huntington Beach. Citywide Urban Runoff Management Plan. 2005. p. 1-1.

[31] City of Huntington Beach. Citywide Urban Runoff Management Plan. 2005. p. 4-7.

opinions for system upgrades, and recommends system improvements to initiate the corrections. The City can then initiate the individual drainage projects within its budgetary, political and discretionary restraints.

5.1.1 Site-Specific Conveyance System

The proposed development site is currently fully developed as a commercial site and is estimated to be 90 percent impervious. There is no storm drain available in either Gothard Street or Center Avenue. The site is within the Westminster Watershed and off-site drainage from the site street flows south along Gothard Street to Edinger Avenue. Flow continues westwardly in Edinger Avenue (or the associated underground storm drain system), until it flows south into the Murdy Channel. Flow in the Murdy Channel continues southward to the East Garden Grove-Wintersburg Channel (C05). A pump station at Heil Avenue lifts water in the Murdy Channel prior to discharge to the East Garden Grove-Wintersburg Channel. The East Garden Grove-Wintersburg Channel runs primarily east to west within the project vicinity and discharges to Bolsa Bay, Huntington Harbour, and eventually, the Pacific Ocean.[32]

All drainage from the site, including roof drainage, driveway drainage, and area drainage, is anticipated to sheet flow to the emergency vehicle access (EVA) lane and Gothard Street.[33] However, in accordance with City project conditions of approval, the proposed project stormwater runoff would be conveyed to a new storm drain system in Gothard Street.

5.1.2 Site-Specific Net Increase

A Preliminary Hydrology Report was prepared to determine both the existing storm drain system available capacity and the effects of the proposed project on capacity exceedence. For the analysis, the proposed project was not expected to alter the amount of impervious surfaces on the project site, but the on-site flow path length and slope increased, based on the Preliminary Grading Plan dated June 4, 2008.[34]

It should be noted that the Preliminary Water Quality Management Plan[35] calculated an existing impervious fraction of 95 percent and a proposed project impervious fraction 73.7 percent, to be confirmed with the PWQMP revision. However, the proposed project is actually expected to have an impervious fraction of 85.5 percent based on the project description and as identified in Table 3 1 - Water Demand for the Proposed Project. Consequently, use of 90 percent in the hydrology analysis for both existing and proposed impervious fractions provides for a conservative estimate of effects on flow rates; a higher proposed project amount of impervious surfaces will result in a greater potential for storm drain system capacity exceedence by the proposed project and greater potential to increase proposed project flow rates.

Conveyance capacity and street flow rates along Gothard Street (including the project site) were assessed using the OCFCD-approved AES program Modified Rational Method[36] street flow analysis through the catchment subareas from McFadden Avenue to Edinger Avenue. County of Orange default data were used to populate the model, where available (e.g., storm event values). In accordance with the MPD and Orange County Hydrology Manual, the site soils are classified as Hydrologic Group C, which means that the pervious area soils have a moderately high runoff rate and somewhat poor infiltration.[37]

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[32] Fuscoe Engineering. Letter dated October 26, 2007 Re: The Ripcurl Development Preliminary WQMP prepared for AMSTAR / Red Oak Huntington Beach, LLC.

[33] Fuscoe Engineering. Letter dated October 26, 2007 Re: The Ripcurl Development Preliminary WQMP prepared for AMSTAR / Red Oak Huntington Beach, LLC.

[34] Fuscoe Engineering. Preliminary Grading Plan. Dated June 4, 2008. Prepared for AMSTAR / Red Oak Huntington Beach, LLC.

[35] Fuscoe Engineering. Preliminary Water Quality Management Plan The Ripcurl Development, Dated June 6, 2008. Prepared for AMSTAR / Red Oak Huntington Beach, LLC.

[36] Engineering Hydrologic Software Solutions. Advanced Engineering Softwater (AES) RATSCx 2007 v. 13.0 for Orange County. (approved for use in Orange County; based on the Orange County Hydrology Manual, 1986).

[37] Highest infiltration and lowest runoff is associated with Hydrologic Group A, and lowest infiltration and highest runoff is associated with soil Hydrologic Group D.

Gothard Street was modeled based on typical cross-section information from the MPD for an 80-foot roadway with 32-foot street half width.

Two scenarios were evaluated: existing conditions and build out of the General Plan. This is because parcels to the north of the project site are currently vacant but could be developed for residential, commercial, or industrial land uses; the future increase in runoff rates from these properties when developed could contribute to greater storm drain system capacity exceedence for the proposed project.

Even though the proposed project would have a higher individual project site peak runoff rate compared to the existing project site, the timing of peak flows result in no overall increase in the proposed project contribution to peak flows within Gothard Street. In other words, the proposed project has no real effect on the downstream drainage peak street flow rates compared to existing conditions. Table 5-1 lists the flow in Gothard Street for the 10-, 25-, 50-, or 100-year design storm events and the project site contribution to flow.

Table 5-1: Estimated Peak Flow Rates in Gothard Street

	10-year		25-year		50-year		100-year	
Location	**Existing Site**	**Proposed Project**	**Existing Site**	**Proposed Project**	**Existing Site**	**Proposed Project**	**Existing Site**	**Proposed Project**
	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
Existing Watersheds								
Southwest Corner of Project Site	24.9	24.9	30.9	30.9	35.4	35.4	40.5	40.5
Project Site Contribution	*5.7*	*5.7*	*7.0*	*7.0*	*7.9*	*7.9*	*8.6*	*8.6*
Full Buildout of General Plan								
Southwest Corner of Project Site	28.5	28.5	35.0	35.0	39.9	39.9	45.6	45.6
Project Site Contribution	*6.5*	*6.5*	*7.0*	*7.0*	*7.9*	*7.9*	*9.0*	*9.0*

SOURCE: PBS&J, 2008.
[a]Minimum used in the MPD model analysis
[b]Overall site slope is assumed to be very flat. Steeper slopes would generate higher peak runoff rates.
[d]ft/ft = feet per feet; cfs = cubic feet per second

Generally, build out of the General Plan resulted in overall higher flow rate in Gothard Street, and sometimes, higher project site contributions to street flow because of the changes in timing of peak flows for the rest of the watershed in comparison with the project site.

5.1.3 Site-Specific Conveyance Capacity

Streets and their associated inlets, storm drain system, parkways, and other features are part of the City storm drain system. Street flow conveyance capacity depends upon the design storm event as well as street physical characteristics. In accordance with City standards and the MPD, during the 10-year storm event, one lane (at least 12 feet) must remain non-flooded. The 25-year storm event can have flow in streets up to the curb height. The 50-year storm event cannot exceed a street flow depth of more than 0.2 feet above the curb and the 100-year storm event cannot exceed a street flow depth of more than 0.5 feet above the curb.

The MPD assessed the City storm drain system for meeting the above requirements. Improvements to the existing storm drain system to meet flood control design requirements for street flow along Gothard Street from Center Avenue to Edinger Avenue were identified. However, actual existing street flow capacity and area runoff was not provided for in the MPD.

The MPD additional required capacity to meet City standards was determined to be 8 cfs (between Center Avenue and Edinger Avenue) to 11 cfs (at Edinger Avenue). The size of this pipe is planned as 2 to 2.5 feet in diameter. The MPD also indicated that additional capacity is needed to improve the section of the storm drain along Edinger Avenue to convey 52 cfs at Gothard Street to 127 cfs, where the storm drain turns south from Edinger Avenue.

Because actual exceedence flows were not known and the MPD did not provide for a means to determine the potential project site contributions to conveyance capacity exceedence, the Preliminary Hydrology Report prepared a more site-specific assessment of potential storm drain system capacity limitations and the effect of the proposed project on these constraints. Table 5-2 lists the design street flow capacities.

Table 5-2: Street Flow Design Capacity for Design Storm Events

Gothard Street Location	Slope[c] (ft/ft)	10-year[a] (cfs)	25-year[a] (cfs)	50-year[b] (ft depth)	100-year[b] (ft depth)
McFadden to Center Ave	0.00158	5.47	15.40	0.87	1.17
Southwest Corner of the Project Site	0.0017	5.70	16.04	0.87	1.17
Between the Project Site and Edinger Ave	0.003	7.57	21.31	0.87	1.17
At Edinger Avenue	0.0016	5.53	15.56	0.87	1.17

SOURCE: PBS&J 2008.

[a] Determined using AES program calculator based on slope, cross-section, and hydraulic coefficients. Street flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway).

[b] Cannot be determined using AES program calculator based on slope, cross-section, and hydraulic coefficients; actual exceedence evaluated based on flow depth in detailed model output. The 10-year storm event must leave one lane (about 12 feet) free of flooding; the 25-year runoff cannot exceed a flow depth higher than the curb height (0.5 feet); the 50-year flow depth cannot exceed a depth 0.2 feet above the curb height (0.7 feet total depth of flow); the 100-year flow depth cannot exceed 0.5 feet above the curb (1.0 feet total depth of flow)

[c] Slope based on best available information as noted in the Preliminary Hydrology Report. The higher slope for the section Between the Project Site and Edinger Ave results in a higher street flow capacity.

Overall, the Preliminary Hydrology Report determined that conveyance capacities were not exceeded for the 50- and 100-year storm events; however, for both the 10- and 25-year storm events, conveyance capacities were exceeded for all conditions, including the existing watershed conditions with the existing project site land use. The 10-year storm event stringent requirements resulted in the largest exceedence rates for this storm event. Therefore, the 10-year storm event flow rates were used as limiting constraint to identify exceedences and mitigation. The project flow rate contribution to street flow exceedence was determined based on the proportion of the project site contributions to overall street flow compared to other property contributions.

Table 5-3 lists the street flow rates and conveyance capacity exceedences for Gothard Street for the 10-year storm event for existing conditions, with and without the proposed project. Table 5-4 lists the street flow rates and conveyance capacity exceedences for Gothard Street for the 25-year storm event for full buildout of the General Plan, with and without the proposed project.

Table 5-3: 10-year Storm Event Conveyance Capacity Exceedence

Gothard Street Location	Existing Watershed			General Plan Buildout		
	Design Flow[a] (cfs)	Street Flow[b] (cfs)	Exceedence[c] (cfs)	Design Flow[a] (cfs)	Street Flow[b] (cfs)	Exceedence[c] (cfs)
Existing Conditions						
At Center Ave	5.47	23.4	17.9	5.47	27.2	21.7
Project Site Contribution[d]		*5.7*	*4.4*		*6.5*	*5.2*
Southwest Corner of the Project Site	5.7	24.9	19.2	5.7	28.5	22.8
Between the Project Site and Edinger Ave	7.57	30.4	22.8	7.57	34.0	26.4
At Edinger Avenue	5.53	40.6	35.1	5.53	42.8	37.3
Existing Conditions with Proposed Project						
At Center Ave	5.47	23.4	17.9	5.47	27.2	21.7
Project Site Contribution[d]		*5.7*	*4.4*		*6.5*	*5.2*
Southwest Corner of the Project Site	5.7	24.9	19.2	5.7	28.5	22.8
Between the Project Site and Edinger Ave	7.57	30.8	23.2	7.57	34.0	26.4
At Edinger Avenue	5.53	40.6	35.1	5.53	43.3	37.8

[a] Street flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area, as described in Section 2.2.2. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway). Model output is provided in Appendix D.
[b] Street flow model output values. See Appendix A for model output.
[c] Exceedence is the difference between modeled street flow and the design flow.
[d] Project contribution is the proportion of peak street flow contributed by the project site. This is representative of the proportion of exceedence that the project site contributes to.
SOURCE: PBS&J 2008.

Table 5-4: 25-year Storm Event Conveyance Capacity Exceedence

Gothard Street Location	Existing Watershed			General Plan Buildout		
	Design Flow[a] (cfs)	Street Flow[b] (cfs)	Exceedence[c] (cfs)	Design Flow[a] (cfs)	Street Flow[b] (cfs)	Exceedence[c] (cfs)
Existing Conditions						
At Center Ave	15.4	29.0	13.6	15.4	33.3	17.9
Project Site Contribution[d]		*7.0*	*3.2*		*7.9*	*4.2*
Southwest Corner of the Project Site	16.0	30.9	14.9	16.0	35.0	19.0
Between the Project Site and Edinger Ave	21.3	37.2	15.9	21.3	41.7	20.4
At Edinger Avenue	15.6	48.9	33.3	15.6	52.6	37.0
Existing Conditions with Proposed Project						
At Center Ave	15.4	*29.0*	*13.6*	15.4	33.3	17.9
Project Site Contribution[d]		*7.0*	*3.2*		*7.9*	*4.2*
Southwest Corner of the Project Site	16.0	30.9	14.9	16.0	35.0	19.0
Between the Project Site and Edinger Ave	21.3	37.6	16.3	21.3	41.7	20.4
At Edinger Avenue	15.6	50.0	34.4	15.6	53.1	37.5

[a] Street flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area, as described in Section 2.2.2. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway). Model output is provided in Appendix D.
[b] Street flow model output values. See Appendix A for model output.
[c] Exceedence is the difference between modeled street flow and the design flow.
[d] Project contribution is the proportion of peak street flow contributed by the project site. This is representative of the proportion of exceedence that the project site contributes to.
SOURCE: PBS&J 2008.

The existing conveyance capacity of Gothard Street is exceeded by about 18 cfs at Center Avenue to 35 cfs at Edinger Avenue for existing watershed conditions and by about 22 cfs at Center Avenue to 38 cfs at Edinger Avenue for build-out of the General Plan within the drainage area. These more site-specific modeled exceedence rates are about 10 to 27 cfs higher than the MPD-identified required improvements.

There was no difference in street flow capacity exceedence with implementation of the proposed project compared to the existing project site. The existing project site and the proposed project contribute about 4.4 cfs to the exceedence capacity of Gothard Street with the existing watershed conditions, and about 5.2 cfs when the watersheds are built out in accordance with the General Plan.

5.1.4 Required Improvements and/or Detention

For an environmental review analysis, because the proposed project would not increase stormwater runoff, detention of excess runoff and improvements would not normally be required. However, because the existing capacity is already exceeded, improvements to the Gothard Street and Edinger Avenue storm drainage systems are already required. Additional analysis provided in the Preliminary Hydrology Report confirmed that capacities are constrained within the Gothard Street drainage system and that the existing project site contributes to capacity exceedence.

The MPD identifies intended improvements to the storm drain system. A storm drain pipeline is required to be built in the east side of Gothard Street, from Center Avenue to Edinger Avenue, where it would

connect to the existing system. Additionally, the portion of the existing storm drain system along Edinger Avenue has been identified as a section needing improvement. The February 2005 estimated cost for the new 2- to 2.5-foot pipeline along Gothard Street is $390,000. The estimated cost for improvement of the existing system along Edinger Avenue is estimated as $328,000.

The Preliminary Hydrology Report identified exceedences of 10 to 27 cfs higher than the MPD (see Section 5.1.3). However, if a one percent slope is used for the new pipes, their sizes would be similar to those identified in the MPD.

As a condition of approval, the proposed project would be required to build the underground storm drain system along Gothard Street from Center Avenue to where it would connect to the Edinger Avenue storm drain system in order to prevent water quality treated water from being discharged to the street. This storm drain system would have to be designed to convey the largest street flow design exceedence flow rate, as well as any permanent groundwater dewatering discharge rate. Additionally, the proposed project would also have to attenuate all project site contributions to exceedence flows on the project site. However, without attenuation, the MPD specified improvements would be required, as a minimum, to mitigate the design street capacity exceedence flows.

Improvements

Table 5-5 lists the required storm drain system improvements for drainage along Gothard Street. Pipes are sized to convey the exceedence flows with a slope of one percent (0.01 ft/ft). If a different slope is used, pipe sizes would have to be reevaluated. The proposed project would be required to implement the storm drain improvements from Center Avenue to Gothard Avenue as a condition of project approval.

Table 5-5: Conveyance Capacity Exceedence: 10-year Storm Event

	Existing Conditions		General Plan Buildout	
Study Area Model Node	**Exceedence[a] (cfs)**	**Pipe size[b] (modeled diameter, ft / nominal size, inches)**	**Exceedence[a] (cfs)**	**Pipe size[b] (modeled diameter, ft / nominal size, inches)**
At Center Ave	17.9	1.8 / 22	21.7	2.0 / 24
Project Site Contribution[c]	*4.4*		*5.2*	
Southwest Corner of the Project Site	19.2	1.9 / 24	22.8	2.0 / 24
Between the Project Site and Edinger Ave	22.8	2.0 / 24	26.4	2.1 / 26
At Edinger Avenue	35.1	2.4 / 30	37.3	2.4 / 30
At Center Ave	17.9	1.8 / 22	21.7	2.0 / 24
Project Site Contribution[c]	*4.4*		*5.2*	
Southwest Corner of the Project Site	19.2	1.9 / 24	22.8	2.0 / 24
Between the Project Site and Edinger Ave	23.2	2.0 / 24	26.4	2.1 / 26
At Edinger Avenue	35.1	2.4 / 30	37.8	2.4 / 30

[a] Exceedence is the difference between modeled street flow and the design flow.
[b] Calculated pipe size with a 1 percent slope to convey exceedence flows
[c] Project site runoff was assumed to enter Gothard Street at Center Avenue in order to maximize project site effects on street flow and obtain a conservative estimate of the project site's contribution to street flow.
SOURCE: PBS&J 2008.

Detention

Stormwater detention possibilities are limited for the project site because it is currently mostly impervious surfaces and will remain mostly impervious surfaces, the soils are not suitable for infiltration (Hydrologic Group C and slowly percolating impervious surfaces), substantial fill would be placed on the eastern

portion, and the groundwater table may be within five feet of the ground surface within this area (Geotechnical Report 2006). Some storage could be provided by maximizing the use of green roofs, underground storage pipes or vaults, and/or rooftop runoff cisterns to store runoff. Because most of the parking for the area would be below-grade, use of microswales within the parking lot to store runoff would not be feasible.

Green roofs could also contribute to both stormwater retention and detention, as well as provide some aesthetic functions. Green roofs can detain 60 to 100 percent of precipitation, depending upon the substrate.[38] If implemented, the project developer should consult with a landscape architect to determine appropriate plantings and maintenance. If a green roof is planned for the proposed project, roof tops must be structurally designed to support the green roof system. Additionally, management and maintenance must be incorporated in the project WQMP to minimize nuisance discharges of pollutants.

5.2 Stormwater Quality

The Santa Ana Regional Water Quality Control Board (SARWQCB) developed the Water Quality Control Plan (Basin Plan) for the Santa Ana Region in 1975, with subsequent updates in 1983 and 1995 and periodic amendments. The Basin Plan guides conservation and enhancement of water resources and establishes beneficial uses of inland surface waters, tidal prisms, harbors, and groundwater basins within the Santa Ana Region. The Basin Plan contains both numerical and narrative water quality objectives that are intended to allow beneficial uses to be protected. The Basin Plan also contains an Implementation Plan that is intended to achieve the overall objectives of the Basin Plan.

In the City, dry weather pollutants of concern include bacteria, pesticides and petroleum hydrocarbons, metals and nutrients. Wet weather pollutants of concern include bacteria, trash and debris, suspended solids, metals, nutrients, and hydrocarbons/oil and grease.[39]

The Huntington Harbour Complex is listed in the 303(d) list as impaired for Chlordane, Copper, Lead, Nickel, Pathogens, PCBs and Sediment Toxicity. For those pollutants contributing to impairment, Total Maximum Daily Loads (TMDLs) will be required. Proposed TMDL completion is 2019.[40]

The project must comply with Order No. R8-2002-0010 (NPDES No. CAS618030), which is the Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and The Incorporated Cities of Orange County Within the Santa Ana Region Areawide Urban Storm Water Runoff Orange County (Municipal NPDES Permit). Compliance will include implementation of source control and treatment control Best Management Practices, as defined in the County of Orange Drainage Area Master Plan (DAMP).

New development and significant redevelopment have been defined in the NPDES permit as the following:

- All significant re-development projects, where significant re-development is defined as the addition of 5,000 or more square feet of impervious surface on an already developed site. This includes additional buildings and/or structures, extension of existing footprint of a building, construction of parking lots, etc.
- Home subdivisions of 10 units or more. This includes single-family residences, multi-family residences, condominiums, apartments, etc.
- Commercial and industrial developments of 100,000 square feet or more. This includes non-residential developments such as hospitals, educational institutions (to the extent the permitees

[38] N.D. VanWoert, D. B. Rowe,J. A. Andresen, C. L. Rugh, R. T. Fernandez, and L. Xiao. 2005. Green Roof Stormwater Retention: Effects of Roof Surface, Slope, and Media Depth. J. Environ. Qual. 34:1036–1044. Available at: http://jeq.scijournals.org/cgi/reprint/34/3/1036.pdf

[39] City of Huntington Beach. Citywide Urban Runoff Management Plan. 2005. p. 3-16.

[40] Fuscoe Engineering. Letter dated October 26, 2007 Re: The Ripcurl Development Preliminary WQMP prepared for AMSTAR / Red Oak Huntington Beach, LLC.

have the authority to regulate these developments), recreational facilities, mini-malls, hotels, office buildings, warehouses, and light and heavy industrial facilities.
- Automotive repair shops (with SIC codes 5013, 5014, 5541, 7532-7534, 7536-7539).
- Restaurants where the land area of development is 5,000 square feet or more.
- All hillside developments on 10,000 square feet or more, which are located on areas with known erosive soil conditions or where the natural slope is twenty-five percent or more.
- Developments of 2,500 square feet of impervious surface or more adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas, such as areas designated in the Ocean Plan as areas of special biological significance or water bodies listed on the CWA Section 303(d) list of impaired waters.
- Parking lots of 5,000 square feet or more exposed to storm water. Parking lot is defined as a land area or facility for the temporary storage of motor vehicles.

The project's residential component qualifies the subject property as a Priority Project, requiring a Project Water Quality Management Plan (PWQMP).

5.2.1 Design Criteria

New development and significant redevelopment provides a key opportunity to incorporate new approaches that, taken collectively, can begin to make a substantial difference in water quality and potentially water quantity over a long period of time as more land in the City develops or redevelops. Design principles that should be considered are listed below:

- Minimize directly connected impervious areas
- Incorporate zero discharge areas or create reduced discharge areas
- Minimize impervious areas/maximize permeability
- Incorporate runoff reduction areas
- Conserve natural areas throughout the site's landscape

Guidelines have been developed to address post-construction urban runoff and stormwater pollution from all new development and significant redevelopment projects. The goal of these guidelines is to ensure that new development and significant redevelopment do not increase pollutant loads from a project site, or contribute to increased urban runoff flow rates or velocities. This goal may be achieved through practicable and enforceable site-specific project-based controls, or a combination of project-based and regional or watershed-based controls.[41]

5.2.2 Site-Specific Stormwater Quality

Because the land use within the project site would not be greatly altered compared to existing conditions, stormwater quality is not expected to be substantially different, and would therefore, require no further reductions for the environmental review process. However, in order to comply with the Municipal NPDES Permit conditions, water quality best management practices (BMPs), in accordance with an approved WQMP, are necessary.

The addition of residential, restaurant, and retail uses could contribute more gross pollutants (e.g., trash, debris, pet waste) to stormwater runoff. Oil and grease, sediment, and metals may decrease because the associated parking would be covered as opposed to the existing surface parking. Pesticides and nutrients used for landscaping would be expected to be similar to existing conditions because the amount of landscaping would remain about the same. Aerially deposited metals, nutrients, and other constituents, would also be expected to remain the same because of the same amount of impervious surfaces.

[41] A Cooperative Project of the County of Orange, the Cities of Orange County and the Orange County Flood Control District. Drainage Area Management Plan. Exhibit 7.II. Model Water Quality Management Plan (WQMP).

5.2.3 Stormwater Quality Management Plan

A Preliminary WQMP (PWQMP) has been prepared by Fuscoe Engineering (Appendix C). The following section summarizes the major elements of PWQMP and evaluates it for completeness, deficiencies, and requirements to amend deficiencies.

Project Information and Description

According to this PWQMP, expected pollutants in stormwater runoff would include sediment, nutrients, trash and debris, bacteria/viruses, oxygen demanding substances, oil and grease, and pesticides. Based on the receiving water impairments, the PWQMP identified the proposed project's Primary Pollutants of Concern as bacteria/viruses, sediments, and pesticides and in another place as bacteria/viruses, heavy metals, sediment, and pesticides.

PWQMP Deficiencies and Requirements

In accordance with the DAMP and City requirements:

- Primary Pollutants of Concern shall be identified as bacteria/viruses, heavy metals, sediment, and pesticides.
- Other Pollutants of Concern shall include all other expected pollutants: nutrients, trash and debris, oxygen demanding substances, and oil and grease.
- Provide site address and planning area number.
- Describe landscaped areas.
- Describe activities that would be routinely conducted outdoors.

Site Design Features

- One trash enclosures and two loading docks that would be located in the covered parking garage. These features would be completely covered and protected from exposure to wind and rain.
- Food preparation areas would be included, but their numbers have not yet been determined.
- No maintenance bays, fueling areas, equipment vehicle wash areas, outdoor processing areas, or community car wash racks.

PWQMP Deficiencies and Requirements

The locations of these BMPs have not been identified on the WQMP Site Plan Exhibit in Section 6.0 of the PWQMP. The PWQMP states that in the event that "*In the event site features are added to the proposed project that are not identified in this WQMP, these features will be designed in accordance with the Orange County Drainage Area Management Plan (OC DAMP, 2003) requirements and City LIP and verified during the precise grade plan check review process.*" Therefore, in accordance with the DAMP and City requirements:

- All site design features for water quality shall be identified in the PWQMP.
- All site design features, including the two loading docks, one trash enclosures, and undetermined number of food preparation areas, shall be located on the WQMP Site Plan Exhibit.

Site Design BMPs

The PWQMP includes site design BMPs.

- Minimize Directly Connected Impervious Area by routing roof top runoff to landscaping, where feasible, prior to discharge to the storm drain system.
- Create reduced or zero discharge areas by draining into vegetation before discharging off-site.

- Minimize impervious area by reducing the project site impervious fraction by about 20 percent.
- Natural areas would not be conserved because there are none on the project site; the project site is already fully developed.

Additionally, detention and retention areas would be incorporated into landscape design.

PWQMP Deficiencies and Requirements

No details on detention and retention areas are provided including depth, area, volume, and locations. In accordance with the DAMP and City requirements:

- Details on detention and retention areas in landscaping shall be provided and locations shall be shown on the WQMP Site Plan Exhibit.
- Landscaped areas on fill material shall be sloped to drain rooftop runoff off of the fill material.

Routine Non-Structural Source Control BMPs

Unless stated otherwise, in accordance with the PWQMP, AMSTAR/Red Oak Huntington Beach, LLC shall bear all responsibility for implementation and maintenance of the following BMPs included in the PWQMP. Should maintenance responsibilities be transferred at any time during the operational life of The Ripcurl development, such as when an Home Owners' Association (HOA) or Property Owners' Association (POA) is formed for the proposed project, a formal Notice of Transfer of Responsibility shall be submitted to the City of Huntington Beach at the time responsibility of the property subject to the PWQMP is transferred. The Transfer of Responsibility shall be incorporated into the PWQMP as an amendment.

Table 5-6: Routine Non-Structural Source Control BMPs Evaluation

BMP		PWQMP[a]	Substantial PWQMP Deficiencies and Requirements
N1	Homeowner/tenant education	Tenants will be provided with stormwater pollution prevention materials prior to occupancy and on an annual basis. Materials shall be provided to the employees that include general housekeeping practices and BMPs. Training and education programs must be provided to all new employees within 6 months of hire date and annually thereafter. Frequency: Annually	None
N2	Activity restrictions	Activity restrictions will be provided to protect surface water quality, through lease terms or other equally effective measure, for the property. Activity restrictions would include such as prohibiting vehicle washing and maintenance, discharge of fertilizer, pesticides, or animals wastes to streets, storm drains and any other activities that might contribute to water pollution.	Covenants, codes, and restrictions (CCRs) shall be developed and enforced by the AMSTAR/Red Oak Huntington Beach, LLC, unless responsibility is formally and legally transferred to another party.

Table 5-6: Routine Non-Structural Source Control BMPs Evaluation

BMP		PWQMP[a]	Substantial PWQMP Deficiencies and Requirements
N3	Common area landscape management	Management programs will be designed and implemented to maintain all common areas. Including proper disposal of landscape wastes. Maintenance shall be consistent with City of Huntington Beach Landscape Water Efficiency Landscape Requirements (Municipal Code Chapter 14.52), plus fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers. Frequency: Monthly	Statements regarding the specific applicable guidelines must be included in the Project WQMP. All trees shall be trimmed by or under the direct observation/direction of a licensed/certified Arborist, for the entire The Ripcurl improvement area. Minimum standards for maintenance and enforcement for the total community shall be established. AMSTAR/Red Oak Huntington Beach, LLC shall rectify problems arising from incorrect tree trimming, chemical applications and other maintenance within the total community.
N4	BMP maintenance	AMSTAR/Red Oak Huntington Beach, LLC shall be responsible for implementation and maintenance of each non-structural BMP and for scheduling inspection and maintenance of structural BMP through staff or contractors. Maintenance of BMPs shall be performed at the frequency prescribed in the WQMP. Records of inspections and BMP maintenance shall be maintained by the Owner and shall be available for review upon request. Frequency: Ongoing	Landscape irrigation maintenance shall be performed in accordance with the approved irrigation plans, the City Water Ordinance and per the City Aboricultural and Landscape Standards and Specifications.
N5	Title 22 Compliance	NA – No hazardous wastes will be generated as part of routine operations	Describe non-routine compliance
N6	Local water quality permit compliance	NA – none required	None
N7	Spill contingency plan	NA – Project site does not mandate the stockpiling of cleanup materials; therefore, it does not require a spill contingency plan	Misinterpretation. Must describe either activity restrictions that prevent the need to stockpile clean up material, or incorporate this BMP such that certain types of building or suite occupancies are mandated to stockpile clean up materials in the case of a spill
N8	Underground storage tank compliance	NA – No underground storage tanks proposed or approved for the proposed project	None
N9	Haz-Mat disclosure compliance	NA – Project site will not handle or dispose of hazardous materials as part of its routine operations	Describe non-routine compliance, such as pool and spa cleaning chemicals
N10	Uniform Fire Code implementation	NA – Project site will not handle or dispose of hazardous materials as part of its routine operations	Describe non-routine compliance
N11	Common area litter control	Trash pick up and sweeping of littered common area performed weekly or whenever necessary. Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Frequency: Monthly	Conflicting descriptions of frequency; change monthly frequency in operations and maintenance table to weekly frequency .

Table 5-6: Routine Non-Structural Source Control BMPs Evaluation

BMP		PWQMP[a]	Substantial PWQMP Deficiencies and Requirements
N12	Employee training	All employees of the Owner and contractors will require training to ensure awareness of activities that may contribute to stormwater pollution including, but not limited to, spill cleanup procedures, proper waste disposal, good housekeeping practices The Owner shall educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Frequency: Annually	Use consistent language; include contractors in both section of PWQMP where this BMP is discussed.
N13	Housekeeping of loading docks	Located in underground parking areas and not exposed to wind or rain. Kept clean and orderly, regularly swept and liter removed. Clean will minimize water use. If water is used, it will be contained, collected, and disposed of in approved manner.	Loading docks shall drain to the sanitary sewer in compliance with the treatment facilities requirements.
N14	Common area catch basin inspection	NA – None proposed	Include and describe how this BMP will be implemented. The proposed project includes an underground storm drain system. For industrial/commercial developments and for developments with privately maintained drainage systems, the owner is required to have at least 80 percent of drainage facilities inspected, cleaned and maintained on an annual basis with 100 percent of the facilities included in a two-year period. Cleaning should take place in the late summer/early fall prior to the start of the rainy season. Drainage facilities include catch basins (storm drain inlets) detention basins, retention basins, sediment basins, open drainage channels and lift stations.
N15	Street and parking lot sweeping	Quarterly street sweeping of all drive aisles, including the EVA lane, and parking areas within the project site and prior to the rainy season, no later than October 1.	None
N17	Retail gasoline outlets	NA – None proposed	None

[a] PWQMP, Fuscoe Engineering 2008, where NA = Not Applicable
SOURCE: PBS&J 2008.

Routine Structural Source Control BMPs:

Unless stated otherwise, in accordance with the PWQMP, AMSTAR/Red Oak Huntington Beach, LLC shall bear all responsibility for implementation and maintenance of the following BMPs included in the PWQMP. Should maintenance responsibilities be transferred at any time during the operational life of The Ripcurl development, such as when an Home Owners' Association (HOA) or Property Owners' Association (POA) is formed for the proposed project, a formal Notice of Transfer of Responsibility shall be submitted to the City of Huntington Beach at the time responsibility of the property subject to the PWQMP is transferred. The Transfer of Responsibility shall be incorporated into the PWQMP as an amendment.

Table 5-7: Routine Structural Source Control BMPs Evaluation

BMP	PWQMP[a]	Substantial PWQMP Deficiencies and Requirements
Provide storm drain stenciling and signage	NA – No storm drains exist on the project site	Include and describe how this BMP will be implemented. In accordance with the Preliminary Grading Plan and WQMP Site Plan Exhibit, implementation of the proposed project will include storm drains and inlets.
Design and construct outdoor materials storage areas to reduce pollutant introduction	NA – There are no outdoor materials storage areas proposed for the project site	Include and describe how this BMP will be implemented. Restate that these will be in underground parking area, not exposed, and drainage would be to sanitary sewer system.
Design and construct outdoor materials storage areas to reduce pollutant introduction	NA – There are no outdoor trash storage areas proposed for the project site	Include and describe how this BMP will be implemented. Restate that these will be in underground parking area, not exposed, and drainage would be to sanitary sewer system
Use of efficient irrigation systems and landscape design	Installation of all common landscape areas using similar planting materials with similar water requirements to reduce excess irrigation runoff. Implementation of efficient irrigation systems including, but not limited to provisions for water sensors and programmable irrigation cycles. The irrigation systems shall be in conformance with water use efficiency guidelines. In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, and day or night time temperatures. Frequency: Monthly	Landscape irrigation maintenance shall be performed in accordance with the approved irrigation plans, the City Water Ordinance and per the City Arboricultural and Landscape Standards and Specifications.
Protect slopes and channels and provide energy dissipation	NA – There are no proposed slopes or channels within the project site.	Include and describe how this BMP will be implemented. In accordance with the WQMP's site plan, two swales are located on the site plan; therefore, channels would be present. In accordance with the Preliminary Grading Plan, fill material will be added to the eastern portion of the project site to 6 to 10 foot depth; therefore, slopes would be present.
Requirements Applicable to Individual Project Features		
Dock areas	NA - Dock areas are located within the building structure and not exposed to stormwater	Change check box to "yes" and summarize BMP as already noted.

Table 5-7: Routine Structural Source Control BMPs Evaluation

BMP	PWQMP[a]	Substantial PWQMP Deficiencies and Requirements
Wash water control for food preparation areas	Any food establishments will have either contained areas, sinks, each with sanitary sewer connections for wash waters containing kitchen food and wastes. If located outside, the contained areas, sinks shall also be structurally covered to prevent entry of the storm water. Adequate signage shall also be provided stating prohibition of discharge to storm drain system.	Clarify if 'contained areas' are only sinks. provide additional containment BMPs (e.g., containment and drainage to the sanitary sewer system) for wash waters from counters, floors, dishwashers, and other areas.
Community car wash racks	NA – No car wash racks are proposed	Include and describe how this BMP will be implemented or include the prohibition of car washing in the Activity Restrictions BMPs. Per the DAMP, in complexes larger than 100 dwelling units where car washing is allowed, a designated car wash area that does not drain to a storm drain system shall be provided for common usage.
Maintenance bays, vehicle wash areas, outdoor processing areas, equipment wash areas, and fueling areas	NA – None proposed	None

[a]NA = Not Applicable; PWQMP, Fuscoe Engineering 2008
SOURCE: PBS&J 2008.

Treatment Control BMPs

Treatment control BMPs are required to treat the Primary Pollutants of Concern for Priority Projects such as the proposed project. Therefore, treatment BMPs must be incorporated treat stormwater runoff for bacteria/viruses, heavy metals, sediment, and pesticides.

In accordance with the PWQMP, runoff from the project site will be mitigated through the use of an 8' x 16' precast StormFfilter™ manufactured by Contech Stormwater Solutions. The StormFilter™ unit will be located at the southeast corner of the project site and has been appropriately size to treat the first-flush runoff from the project site. A StormFilter™ Unit is a pre-cast vault storm drain insert system that uses passive, siphon-activated media-filled cartridges that trap and adsorb particulates and pollutants. Runoff flows through the filter cartridges containing media and collects in the center of the cartridge for discharge, and flow separators trap floating debris and material. Media types include perlite, zeolite, granular activated carbon, CSF Leaf Media™ and MetalRx™. Targeted pollutants include TSS, oil & grease, soluble metals, nutrients, organics, and trash and debris. StormFilters™ are effective at treating suspended solids (80%), phosphorous (62%), dissolved metals (40-60%), bacteria indicators (50-75%), as well as oils and grease and pollutants attached to sediments. However, the media filter type and effectiveness for the pollutants of concern has not been specified. The use of a StormFilter™ to treat stormwater runoff is an effective treatment control, provided the appropriate media filter is used.

One StormFilter™ unit is proposed for the site, which will be located at the southwest corner of the property, under the EVA lane. In accordance with the DAMP, the treatment BMP will be sized to treat the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour for each hour of a storm event. Therefore, assuming a proposed project runoff coefficient of 0.70 (based on an impervious fraction of 73.7 percent) the design flow rate would be 0.532 cfs. Therefore, a 17 cartridge units, which provides 0.561 cfs of treatment would be required.

In accordance with the Maintenance of Treatment Controls (PWQMP Section 5.2), during the rainy season (October 1 to April 30), the unit should be inspected monthly or prior to a target storm, and

annually in May, and cleaned out once per year at a minimum. More frequent inspection throughout the first year of installation is essential to determine the annual loading patterns and confirm suggested maintenance schedule. Cartridges should be replaced on an as-needed basis, at a minimum of once every two years. Manufacturer's specifications may recommend additional maintenance. The minimum frequency of maintenance shall be in accordance with the Manufacturer's recommendations. AMSTAR / Red Oak Huntington Beach, LLC shall be responsible for treatment control BMP operations and maintenance.

PWQMP Deficiencies and Requirements

- Specify media type to remove pollutants of concern.
- No other treatment control BMPs were identified or proposed in the PWQMP; however, two swales were indicated on the PWQMP Site Plan Exhibit. The PWQMP shall describe BMPs to stabilize and maintain channel.

<u>Other Requirements</u>

PWQMP Deficiencies and Requirements

In accordance with the DAMP and City requirements:

- Describe general community facilities such as, laundry, car wash, swimming pools, Jacuzzis, parks, open space, tot lots, and others.
- Identify existing zoning and if new zoning would be implemented.
- More completely describe pre-project drainage and how it ties into the drainage of surrounding or adjacent areas and describe how planned project drainage will tie into drainage of surrounding or adjacent areas.
- Ensure that all figures have a North arrow.
- Label all outdoor activity areas on the Site Plan Exhibit.
- Depict where and how on-site drainage ties into the off-site drainage system.

6.0 References

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U.S. Environmental Protection Agency and National Science Foundation (USEPA). 2004. ETV Joint Verification Statement for The Stormwater Management StormFilterTM Using ZPG Filter Media. The Environmental Technology Verification Program. July 2004. Available at: http://www.epa.gov/etv/pubs/600etv06039s.pdf.

Appendix A

The Ripcurl Development – Water Utilities Technical Study Water Availability

City of Huntington Beach

2000 Main Street ♦ PO Box 190 ♦ CA 92648

Travis K. Hopkins, PE
Director

Department of Public Works
(714) 536-5431

May 19, 2008

Andrew Nelson
Red Oak Investments
2101 Business Center Drive, Suite #230
Irvine, CA 92612

Dear Mr. Nelson:

Subject: The Ripcurl Development – Water Utilities Technical Study & Water Availability

The City of Huntington Beach (City), Public Works Department received your second draft Water Utilities Technical Study (TS) report dated April 2008. Based on the project description from the TS, data from the City's 2005 Urban Water Management Plan (UWMP), the City's 2005 Water Master Plan (WMP), and the City's tracking of accumulation of projected demands by various new development projects; the City should be able to provide water for the Ripcurl project. City comments to the TS will be returned to you separately this week.

As you know, several current events will potentially impact the reliability of the water supply in the region. In your next submittal of the draft TS, please include a section to list any pro-active solutions that you may have, specifically in the areas of water conservation efforts and water efficient fixtures and landscaping/irrigation practices, to minimize any adverse impact this proposed development will have on the City's current water supply. City staff and its consultant both agree that installation of water-conserving fixtures together with active water-conserving habits can result in much lower water use.

To date, approximately 600 acre-feet per year (afy) of City surplus water has been committed for various other City approved development projects. Your project is currently pending Number 1 status. Your pending status will only remain active if your re-submittal of the TS is received by the City within 21 calendar days from the date of this letter. Please also note that the 600 afy of surplus water committed may increase as additional smaller projects get approved, making it necessary to adjust the final version of your TS.

City approved TS will expire two (2) years from the date of approval. You may request for an extension, provided there is adequate support for the delay in construction of the project. Finally, the City makes no guarantees to deliver surplus water with all committed and pending development projects that have not begun construction prior to the completion of the future 2010 UWMP. If the future 2010 UWMP update indicates a significant reduction in the amount of surplus water available to the City, re-evaluation may be required.

Per the City's WMP from which the demand projections in the 2005 UWMP came, the 3.8-acre Ripcurl property was projected to have a duty factor of 1,480 gallons-per-day-per-acre (gpdpa). This was based on the preliminary evaluation of your property, originally zoned as commercial. This would calculate to approximately 6 afy of water planned for your property, and would not be counted against the City's surplus water supply in determining water availability for your project since it was already counted in the latest UWMP.

The description of the proposed type of use is mixed-use with very high residential density. The City is relatively new to this type of project and therefore precise data is not available regarding the number of persons per dwelling unit or consumption per person; However, the use of 1.5 persons per dwelling unit for mixed-use at this very high density is reasonable. Per the City's 2005 UWMP average residential use of water, including irrigation is 109 gallons per day per capita (gpdc). This would imply the project usage would be (1.5 x 109) or 163.5 gallons per day per dwelling unit (gpd/du). The City believes that with currently available water efficient fixtures, growing awareness of the need to use water efficiently, and minimal irrigation use on this type of project, the demand should be much less than 109 gpdc.

Our own independent research has identified resources such as DrinkTap.org (see attached), which indicates that daily indoor use per capita ranges from an average of 70 gpdc to as low as 45 gpdc, if more efficient water fixtures were installed. Using 1.5 people per dwelling unit, the demand would be (1.5 x 70) or 105 gpd/du. We believe the Governor's plan to reduce demand through conservation efforts and use of water efficient fixtures by 20 percent by 2020, is consistent with the City's policy to use water efficiently (refer to City's Municipal Codes 14.16; 14.18; 14:52), and therefore we expect all new development within the City to make every effort possible to both educate the public to conserve water, and to promote and implement the use of water efficient fixtures and appliances. Our goal is to continue to increase the reliability of our water supply through efficient use of water; and aim for an inside water use of 45 gpdc for new projects.

Below is a list of some methods and practices that can help achieve these goals:

- Waterless urinals in the commercial and restaurant area; ultra low-flush or dual-flush toilets in the condo units.
- Aggressive drought tolerant landscape design with the option to utilize artificial turf and efficient irrigation systems including smart irrigation controllers.
- Ultra water efficient clothes washers and other appliances in any common area, and incentives for new residents to purchase ultra water efficient appliances.
- Provide signs throughout the proposed project site to wisely use water and to make available resources to learn how to use water efficiently.

Based on current information available to the City, the number of proposed dwelling units, the size of the commercial portion of the development alternatives submitted, the City and State conservation and efficient use objectives, the City believes the following duty factors are reasonable for this project:

- Dwelling Unit – Density of 1.5 people per unit, with maximum of 105 gallons per day per dwelling unit
- Commercial/Restaurant - 1.5 gallons per day per square feet
- Commercial/Office - 0.15 gallons per day per square feet
- Aggressive Drought Tolerant Landscaping – 0.01 gallons per day per square feet

Based on preliminary informal calculations, we estimate the annual total demand to be approximately 59 afy. Since 6 afy was pre-planned by the City, the difference, of around 53 afy must be served through surplus water.

Please note that future changes in description of the proposed development (i.e. land use statistics) will require adjustment to the TS.

We hope you find the information provided herein useful in your analysis and preparation of the TS. If you have any questions, please contact Lili Hernandez at (714) 536-5386.

Sincerely,

Duncan Lee
Principal Civil Engineer

DL:cs

Attachment

Cc: Travis Hopkins, Public Works Director
Howard Johnson, Utilities Manager
Todd Broussard, Acting City Engineer
Lili Hernandez, Civil Engineering Assistant

Water Information
Conservation
Conservation at Home
Conservation Outside
Straight Talk on Conservation
Drought Fact Sheet
Water Use Statistics
People Behind the Water
Water in the News
Your Water Utility

Water Use Statistics

Daily indoor per capita water use in the typical single family home is 69.3 gallons. Here is how it breaks down:

Use	Gallons per Capita	Percentage of Total Daily Use
Showers	11.6	16.8%
Clothes Washers	15.0	21.7%
Dishwashers	1.0	1.4%
Toilets	18.5	26.7%
Baths	1.2	1.7%
Leaks	9.5	13.7%
Faucets	10.9	15.7%
Other Domestic Uses	1.6	2.2%

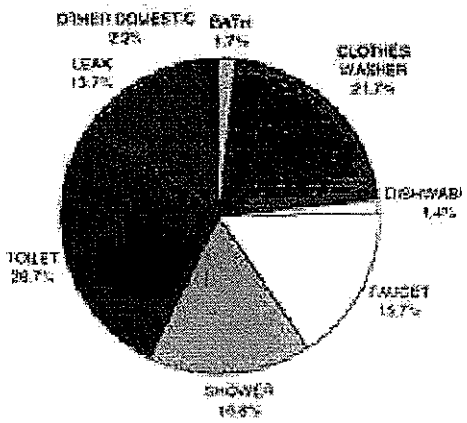
By installing more efficient water fixtures and regularly checking for leaks, households can reduce daily per capita water use by about 35% to about 45.2 gallons per day Here's how it breaks down for households using conservatic measures:

Use	Gallons per Capita	Percentage of Total Daily Use
Showers	8.8	19.5%
Clothes Washers	10.0	22.1%
Toilets	8.2	18.0%
Dishwashers	0.7	1.5%
Baths	1.2	2.7%
Leaks	4.0	8.8%
Faucets	10.8	23.9%
Other Domestic Uses	1.6	3.4%

Source: Handbook of Water Use and Conservation, Amy Vickers

If all U.S. households installed water-saving features, water use would decrease by 30 percent, saving an estimated 5.4 billion gallons per day. This would result in dollar-volume savings of $11.3 million per day or more than $4 billion per year.

- Water-conserving fixtures installed in U.S. households in 1998 alone save 44 million gallons of water every day, resulting in total dollar-value savings of more than $33.6 million per year.
- Average household water use annually: 127,400 gallons
- Average daily household water use : 350 gallons



Residential End Uses of Water (Denver, Colo
AWWARF, 1999).

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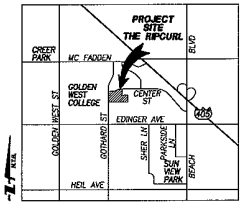
Appendix B

Hydraulic Capacity Analysis

THE RIPCURL
ONSITE WATER EXHIBIT



VICINITY MAP
N.T.S.

DOMESTIC DEMAND

- CONDOMINIUMS @ 440 DU = 122.2 GPM
- RESTAURANT @ 3,000 SQ.FT. = 3.1 GPM
- COMMERCIAL/RETAIL @ 7,000 SQ.FT. = 1.5 GPM
- OFFICE @ 7,000 SQ.FT. = 1.5 GPM
- DROUGHT TOLERANT LANDSCAPE @ 23,773 SQ.FT = 0.2 GPM

TOTAL AVERAGE DAY DOMESTIC DEMAND = 128.5 GPM

FIRE FLOW DISTRIBUTION

4,000 GPM @ 3 FIRE HYDRANTS

PRESSURE READINGS

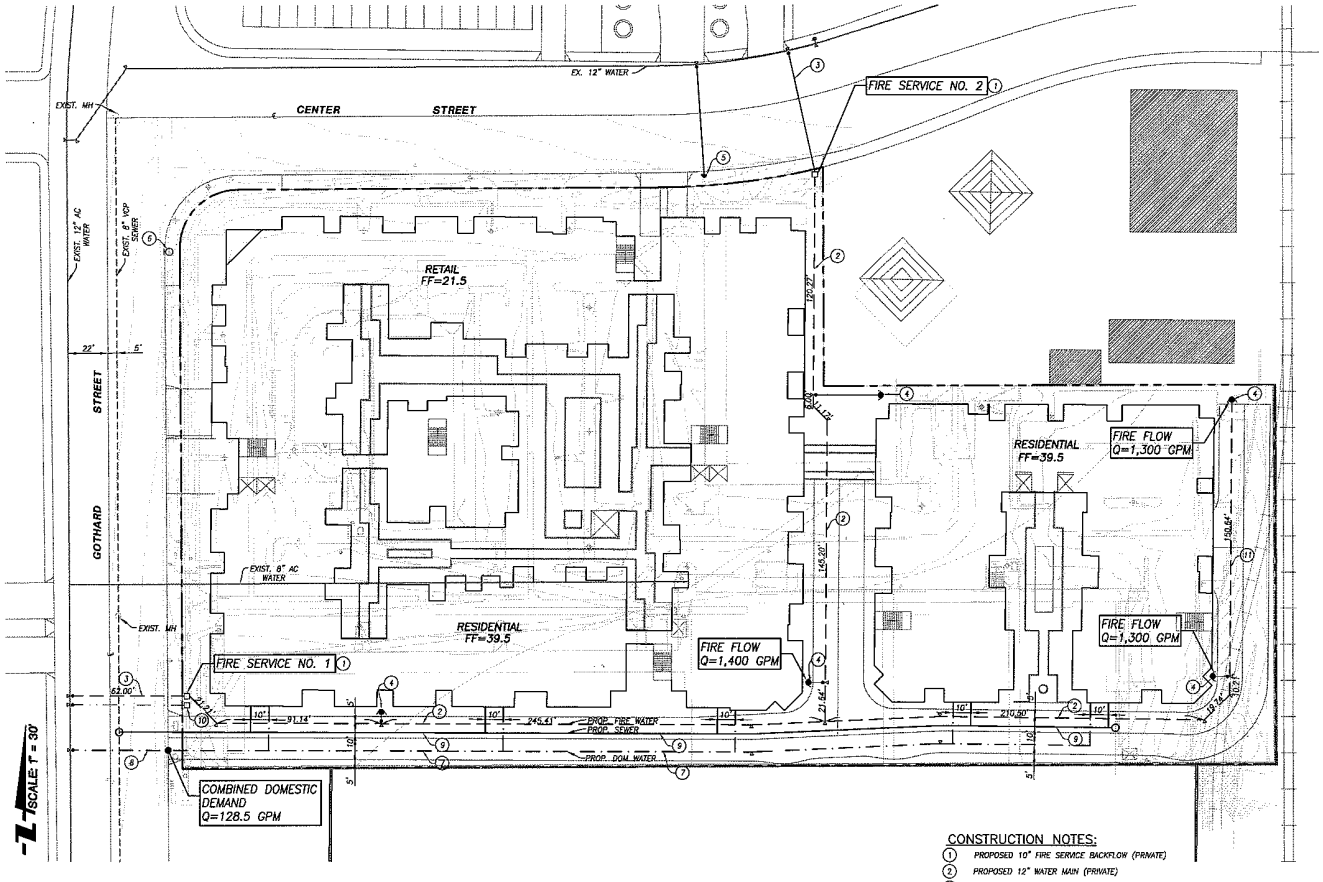
- FIRE SERVICE NO. 1 (GOTHARD)
  STATIC PRESSURE = 70 PSI
  RESIDUAL PRESSURE = 60 PSI
  (@ 4,000 GPM TOTAL SCENARIO)
- FIRE SERVICE NO. 2 (CENTER)
  STATIC PRESSURE = 68 PSI
  RESIDUAL PRESSURE = 58 PSI
  (@ 4,000 GPM TOTAL SCENARIO)

NOTES:

- THIS EXHIBIT ILLUSTRATES THE CONCEPTUAL DESIGN OF THE PROPOSED WATER FACILITIES FOR THE PURPOSE OF EVALUATING THE WATER SUPPLY TO THE DEVELOPMENT AND ADDRESS FIR REQUIREMENTS. THE FINAL PIPELINE ALIGNMENT, SEPARATION WITH SEWER LINES AND ANY POTENTIAL REPLACEMENT OF EXISTING PIPELINES SHALL BE ANALYZED FURTHER UNDER A SEPARATE REVIEW PROCESS AND APPROVED BY THE CITY.
- EXCEPT FOR THE FIRE HYDRANTS, ALL FIRE, DOMESTIC AND IRRIGATION LINES CONNECTED TO ANY OF THE PROPOSED FIRE AND DOMESTIC DISTRIBUTION MAINS WILL REQUIRE ADDITIONAL BACKFLOW DEVICES.

LEGEND:

- EXIST. PUBLIC WATER LINE
- PROP. SEWER
- PROP. DOMESTIC WATER
- PROP. FIRE WATER
- PROP. IRRIGATION WATER
- PROP. FIRE HYDRANT
- EXIST. FIRE HYDRANT



CONSTRUCTION NOTES:

1. PROPOSED 10" FIRE SERVICE BACKFLOW (PRIVATE)
2. PROPOSED 12" WATER MAIN (PRIVATE)
3. PROPOSED 12" FIRE SERVICE LATERAL (PUBLIC)
4. PROPOSED FIRE HYDRANT (PRIVATE)
5. PROPOSED FIRE HYDRANT (PUBLIC)
6. EXISTING FIRE HYDRANT
7. PROPOSED DOMESTIC WATER AND BACKFLOW (PRIVATE)
8. PROPOSED DOMESTIC WATER SERVICE, LATERAL METER (PUBLIC)
9. PROPOSED SEWER LINE (PRIVATE)
10. PROPOSED IRRIGATION SERVICE METER/LATERAL WITH BACKFLOW
11. PROPOSED 8" WATER MAIN (PRIVATE)

REQUIRED FIRE FLOW = 4,000 GPM (TO BE PROVIDED BY 3 HYDRANTS)
(8,000 GPM WITH 50% REDUCTION FOR SPRINKLERS)

APPROVED BY DUNLAP LEE 5/20/2008

Plans prepared by:
Job Number: 863.01
FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

SHEET 1 OF 2

THE RIPCURL
ONSITE WATER EXHIBIT

CITY OF HUNTINGTON BEACH
PUBLIC WORKS DEPARTMENT

5/19/08

CITY OF HUNTINGTON BEACH
ON SITE WATER EXHIBIT

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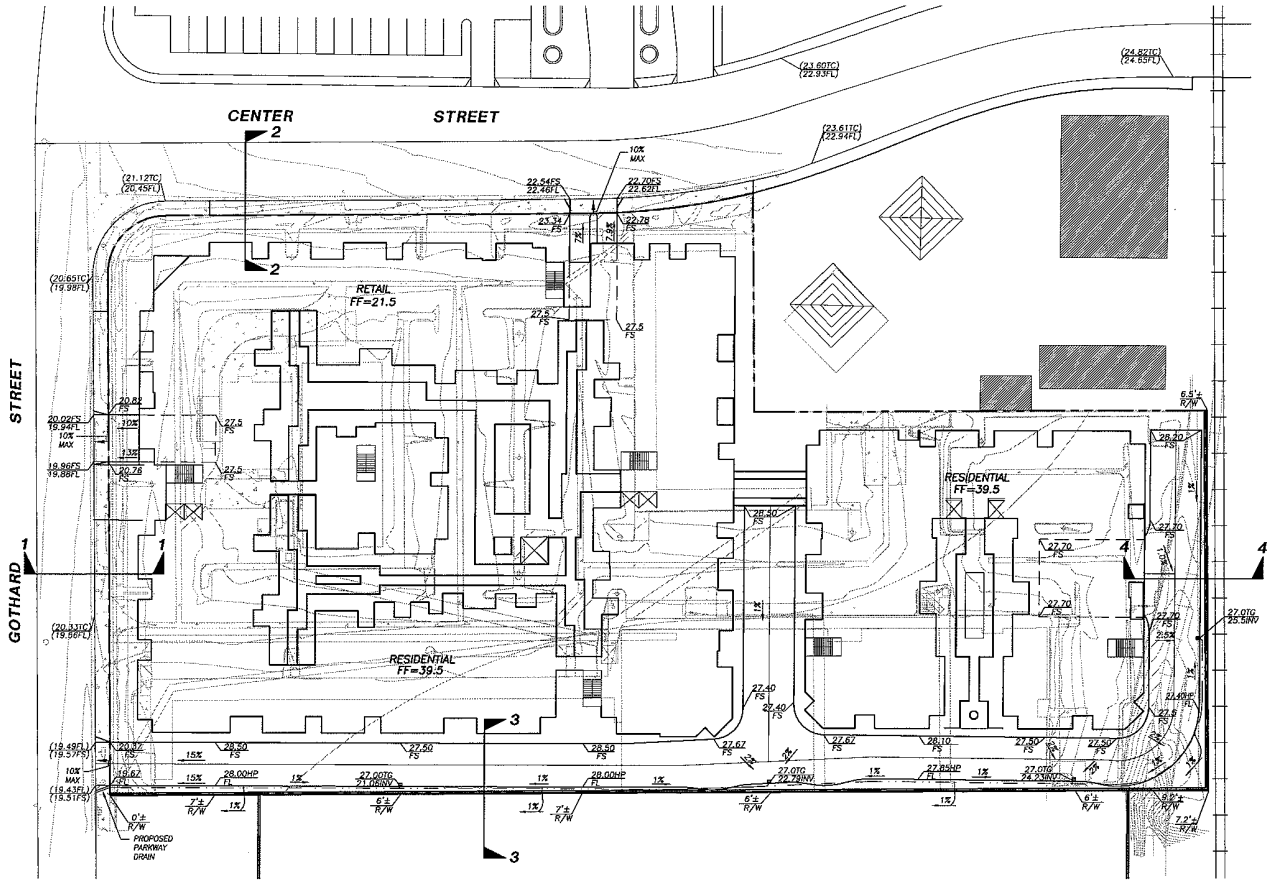

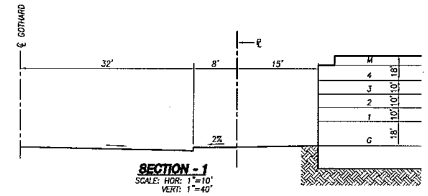

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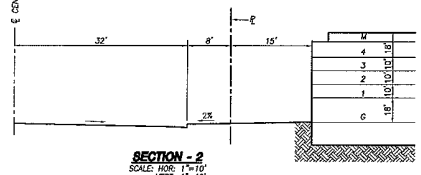
VERT: 1"=40'



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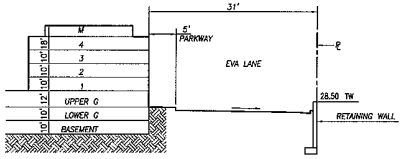

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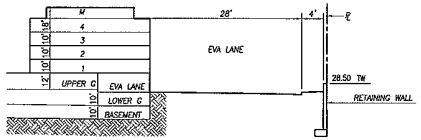

SECTION - 4
SCALE: HOR: 1"=10'
VERT: 1"=40'

PRELIMINARY EARTHWORK QUANTITIES

CUT..... 80,000 CY
FILL..... 5,000 CY

APPROVED BY DUNCAN LCE 5/20/2008

SHEET 2 OF 2

Plans prepared by:
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THE RIPCURL ONSITE WATER EXHIBIT

CITY OF HUNTINGTON BEACH
PUBLIC WORKS DEPARTMENT

CITY OF HUNTINGTON BEACH
ON SITE WATER EXHIBIT

5/19/08

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Appendix C

Water Quality Management Plan (WQMP) The Ripcurl Development (No Appendices)

PRELIMINARY WATER QUALITY MANAGEMENT PLAN

Project Site:
THE RIPCURL
Huntington Beach, CA

Prepared for:
AMSTAR/RED OAK HUNTINGTON BEACH, LLC
2101 Business Center Drive, #230
Irvine, CA 92612

Project Manager:
Hugo Ramirez

Date Prepared: June 6, 2008
JN: 863.01.01

Prepared by:

FUSCOE ENGINEERING
16795 Von Karman Avenue, Suite 100
Irvine, CA 92606
(949) 474-1960
www.fuscoe.com

WATER QUALITY MANAGEMENT PLAN (WQMP)

THE RIPCURL DEVELOPMENT

SITE PLAN REVIEW NO. 07.31
APPLICATION NO. 2007-219
CONDITIONAL USE PERMIT 07-043

located at Center Avenue and Gothard Street
in the
City of Huntington Beach
County of Orange, California

Prepared for:

AMSTAR/ RED OAK HUNTINGTON BEACH, LLC
2101 Business Center Drive, #230
Irvine, CA 92612
949.733.2000

Prepared by:

FUSCOE ENGINEERING, INC.
16795 Von Karman Ave, Suite 100
Irvine, CA 92606
949.474.1960

Date Prepared: June 6, 2008

OWNER'S CERTIFICATION

WATER QUALITY MANAGEMENT PLAN (WQMP)

City of Huntington Beach Planning Application No. 2007-219
Site Plan Review No. 07-031
Conditional Use Permit No. 07-043

This Water Quality Management Plan has been prepared for AMSTAR / Red Oak Huntington Beach, LLC by Fuscoe Engineering, Inc. This WQMP intended to comply with the requirements of the City of Huntington Beach Public Works Department, as conditioned by Site Plan Review 07-031, and Public Works Project Implementation Code Requirements item 11.12, a-i, requiring the preparation for a project-specific Water Quality Management Plan (WQMP).

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with current Orange County Drainage Area Management Plan (DAMP) and the intent of the storm water and urban runoff NPDES permit and Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated cities of Orange County under the jurisdiction of the Santa Ana Regional Water Quality Control Board. A copy of this WQMP will be maintained at the project site or project office.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this WQMP. At least one copy of the approved and certified copy of this WQMP shall be available on the subject property in perpetuity. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend this WQMP.

Signature	Title
Name	Company
Address	
Phone	Date

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APPENDICES

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Appendix B Notice of Transfer of Responsibility
Appendix C Post-Construction BMP Fact Sheets
Appendix D Conditions of Approval / Project Implementation Code Requirements
Appendix E Record of BMP Implementation, Maintenance, and Inspection
Appendix F 303(d) List of Water Quality Limited Segments and TMDL List
Appendix G Orange County Guidelines for the Use of Fertilizers and Pesticides, City of Huntington Beach Water Efficient Landscape Requirements (Municipal Code 14.52)

FIGURES

Figure 1 Vicinity Map
Figure 2 Changes in site drainage and the coefficient of runoff as a result of the proposed improvements.

BMP TABLES

Table 1 Site Design BMPs
Table 2 Routine Non-Structural BMPs
Table 3 Routine Structural BMPs
Table 4 Treatment Control BMPs

PLOT PLANS (INCLUDED IN SECTION 6.0)

Exhibit 1 Vicinity Map
Exhibit 2 Site Plan
Exhibit 3 WQMP Plot Plan

EDUCATIONAL MATERIALS (INCLUDED IN SECTION 7):

- The Ocean Begins at Your Front Door
- Tips for Landscape & Gardening
- Tips for Using Concrete and Mortar
- Sewage Spill Reference Guide
- Waste Oil Collection Centers for North OC
- Proper Maintenance Practices for your Business
- SD-10 Site Design & Landscape Planning
- SD-12 Efficient Irrigation
- SD-13 Storm Drain Signage

POST-CONSTRUCTION BMP FACT SHEETS (INCLUDED IN APPENDIX C)

- DF-1 Drainage Facility Operation & Maintenance
- FP-2 Landscape Maintenance I
- IC-3 Building Maintenance
- IC-7 Landscape Maintenance II
- IC-15 Parking and Storage Area Maintenance
- IC-17 Spill Prevention and Cleanup
- IC-21 Waste Handling and Disposal

[*The above listed Orange County Stormwater Program BMP Fact Sheets will be provided in the Final WQMP*]

- Stormfilter Maintenance Guidelines

INTRODUCTION

This Water Quality Management Plan (WQMP) has been prepared to provide specifications for the post-construction management of storm water runoff from the proposed project at The Ripcurl Development. Improperly managed runoff can be a significant source of water pollution causing impacts to aquatic habitat, wildlife, and water-dependent beneficial uses. The implementation of this plan ensures that such impacts are reduced to the Maximum Extent Practicable (MEP).

This WQMP covers the post-construction operations on The Ripcurl Development, in the City of Huntington Beach, California (see Vicinity Map in Section 6.0). It has been developed as required under State Water Resources Control Board (SWRCB) Municipal NPDES Storm Water Permit for the County of Orange and the Incorporated Cities of Orange County, and in accordance with good engineering practices. This WQMP describes this facility and its operations, identifies potential sources of storm water pollution at the facility, and recommends appropriate Best Management Practices (BMPs) or pollution control measures to reduce the discharge of pollutants in storm water runoff.

1.0 DISCRETIONARY PERMIT NUMBER(S), WATER QUALITY CONDITION NUMBER(S) AND CONDITIONS

To be provided in the Final WQMP submittal for the project.

2.0 PROJECT DESCRIPTION

2.1 FACILITY DESCRIPTION

The proposed residential/commercial podium development is a 3.8 acre parcel located at the southeast corner of Center Avenue and Gothard Street in the City of Huntington Beach. The Standard Industrial Classification (SIC) numbers that may apply to this site include, but are not limited to the following:

- 8811 Private Households
- 5399 Miscellaneous General Merchandise Stores
- 5699 Miscellaneous Apparel and Accessory Stores
- 5812 Eating Places
- 5813 Drinking Places (alcoholic Beverages)
- 7832 Motion Picture Theaters, Except Drive-In
- 7991 Physical Fitness Facilities
- 7521 Automobile Parking

Under the existing conditions, the site is a fully developed commercial site, zoned Commercial General. The site surrounded by other commercial centers on all sides.

PROJECT SUMMARY	
FACILITY	SIZE
Buildings footprints, sidewalks, and associated parking	2.8
Landscaping (pervious areas)	1.0
Total Site Area	3.8 acres

The proposed project will include the demolition of the existing site. The project will be a podium style project with 10,000 square feet of retail space, approximately 440 residential units and 7,000 square feet of leasing, lobby and recreation area. There will be approximately 44,000 square feet of landscaping throughout the project site. Refer to the Site Plan in Section 6.0 for location of proposed facilities.

Prior to construction, approximately 95% of the site is impervious and the runoff coefficient is 0.86. After completion, the entire site will be approximately 73.65% impervious and the runoff coefficient will be 0.70.[1] These statistics are summarized in the figure below.

[1] Runoff coefficients derived from Table A-1 of Attachment A of the Orange County Local WQMP (August 13, 2003).

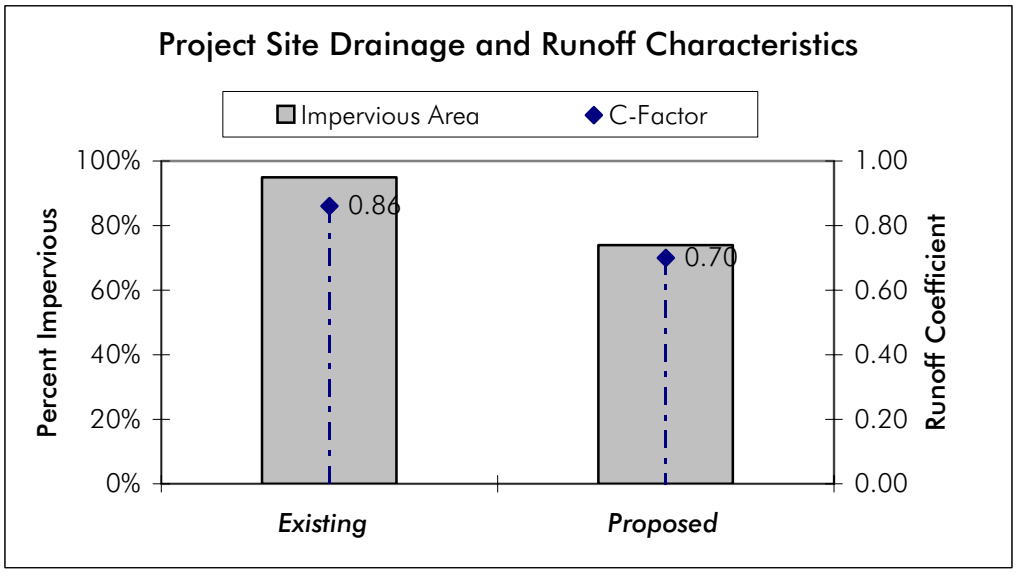


Figure 1. Changes in site drainage and the coefficient of runoff as a result of the proposed improvements.

2.2 PROJECT FEATURES

PARKING FACILITIES

Parking will be provided in the center of the site in the form of an underground parking structure. When the project is complete, approximately 600 covered parking spaces will be provided.

LANDSCAPED AREAS

The proposed project will incorporate landscaping into the project design in the form of landscaping adjacent to buildings and roadways. Total landscaping for the project site will be approximately 1.0 acre. Upon completion, approximately 26.4% of the project site will be landscaped. Further details on the swales is provided in Section 4.3.

ANTICIPATED AND POTENTIAL POLLUTANTS

As a result of the proposed project's alteration of existing conditions, the project site will create new pollutant sources, and in turn, change the makeup of pollutant constituents generated by The Ripcurl Development's operations. But because storm water runoff pollution is diffuse in nature, the composition, level, and cumulative effects of specific pollutants generated by the Project cannot be appropriately quantified. Based on the proposed land uses for The Ripcurl Development, however, this project WQMP can predict the anticipated and potential pollutants generally associated with the project's post-construction operations. With this information in hand, this will allow the project WQMP to appropriately assign BMPs to effectively mitigate storm water pollution prior to the runoff discharging off-site.

The table below, derived from the Countywide Model WQMP, summarizes the categories of land use or project features of concern and the general pollutant categories associated with them. The types of project features listed below that are proposed for The Ripcurl Development are: Attached Residential, Commercial/Industrial Development, and Restaurants. As a result, anticipated pollutants include: bacteria/virus, nutrients, sediment, pesticides, trash & debris, oxygen demanding substance, and oil & grease. Parking lots are not considered a priority project category because the project's parking lot is subterranean and is not exposed to storm water.

GENERAL POLLUTANT CATEGORIES									
Priority Project Categories and/or Project Features	BACTERIA/ VIRUS	HEAVY METALS	NUTRIENTS	PESTICIDES	ORGANIC COMPOUNDS	SEDIMENTS	TRASH & DEBRIS	OXYGEN DEMANDING SUBSTANCES	OIL & GREASE
Detached Residential Development	X		X	X		X	X	X	X
Attached Residential Development	P		X	X		X	X	P(1)	P(2)
Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	X	P(1)	X
Automotive Repair Shops		P			X(4,5)		X		X
Restaurants	X						X	X	X
Hillside Development >5,000 ft^2 in SDRWQCB	X		X	X		X	X	X	X
Hillside Development >10,000ft^2 in SARWQCB	X		X	X		X	X	X	X
Parking Lots	P (6)	X	P (1)	P (1)	X (4)	P (1)	X	P (1)	X
Streets, Highways & Freeways	P (6)	X	P (1)	P (1)	X (4)	X	X	P (1)	X

Notes:
X = Anticipated
P = Potential
(1) A potential pollutant if landscaping or open area exist on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.
(6) Analyses of pavement runoff routinely exhibit bacterial indicators.

Source: County of Orange Flood Control District, *2003 Drainage Area Master Plan, Table 7-1.3*, July 1, 2003.

OWNERSHIP OF SITE

The table provided below describes the ownership of all land space within the project site once the construction of the project has been completed.

SITE FEATURE	OWNER
Public Streets	City of Huntington Beach
Private Streets	AMSTAR / Red Oak Huntington Beach, LLC
Landscaped Areas	AMSTAR / Red Oak Huntington Beach, LLC
Buildings	AMSTAR / Red Oak Huntington Beach, LLC

AMSTAR / Red Oak Huntington Beach, LLC will be responsible for inspecting and maintaining all BMPs prescribed for The Ripcurl Development. Neither a Home Owner's Association (HOA) nor Property Owners Association (POA) will be formed for the Project at this time.

2.3 SPECIFIC INDUSTRIAL / COMMERCIAL DETAILS

The Ripcurl Development will include one (of two) podium style building that will have commercial uses on its ground floor. The west building, as it is referred to herein, will have retail space along the street frontage of Center Avenue and Gothard Street. Refer to the WQMP Site Plan available in Section 6.0 for the location of the proposed building.

No outdoor storage of materials is anticipated (materials will be stored indoors). Materials anticipated to be stored on-site include those associated with commercial developments (i.e. cleaning products, inventory storage, etc.); however, no hazardous wastes will be stored on-site. The project is not anticipated to generate any wastes that would be considered hazardous. All wastes shall be collected and properly disposed of off-site (see Section 4.2 for source control BMPs related to these features).

New developments and significant redevelopments generally incorporate certain site features that may potentially impact storm water runoff quality if proper site design is not considered. These features include, but are not limited to, trash enclosures, loading docks, maintenance bays, vehicle or equipment wash areas, outdoor processing areas, fueling areas, food preparation areas, and community car wash areas. The following table provides a breakdown of specific features proposed for the project site.

SITE FEATURES SUMMARY		
SITE FEATURE	**NUMBER**	**POLLUTANTS OF CONCERN**
Trash Enclosures	1*	Trash and debris, bacteria
Loading Docks	2*	Organic compounds, trash and debris, oil and grease, heavy metals, wash water
Maintenance Bays	0	Trash and debris, oil and grease, heavy metals
Fueling Areas	0	Oil and grease, heavy metals, organic compounds

SITE FEATURES SUMMARY		
SITE FEATURE	NUMBER	POLLUTANTS OF CONCERN
Equipment / Vehicle Wash Areas	0	Trash, sediment, oil and grease, washing compounds (soap)
Food Preparation Areas	TBD	oil and grease, bacteria/virus
Outdoor Processing Areas	0	Trash and debris, heavy metals, oil and grease
Community Car Wash Racks	0	Trash, sediment, oil and grease, washing compounds (soap)

* The trash enclosure and loading docks are located in the covered parking garage. The trash enclosure and loading docks are fully covered; neither feature will be exposed to rainfall or wind. Additionally the lowest level of the parking garage will have a sewer connection for mitigation of all nuisance water generated within the subterranean levels.

For the locations of these site features identified above, please refer to the WQMP Site Plan Exhibit provided in Section 6.0 of this WQMP. In the event site features are added to the proposed Project that are not identified in this WQMP, these features will be designed in accordance with the Orange County Drainage Area Management Plan (OC DAMP, 2003) requirements and City LIP and verified during the precise grade plan check review process.

2.4 SPECIFIC RESIDENTIAL DETAILS

The Ripcurl Development project will include 440 residential units within a two building complex.

The residential units will vary in size from studios and lofts to larger two bedroom apartments. There will be a total of four levels of residential units averaging 90 units per level. Units will range from 465 to 1037 square feet in size.

For the locations of these site features identified above, please refer to the Site Plan Exhibit provided in Section 6.0 of this WQMP. In the event site features are added to the proposed Project that are not identified in this WQMP, these features will be designed in accordance with the Orange County Drainage Area Management Plan (OC DAMP, 2003) requirements and City LIP and verified during the precise grade plan check review process.

3.0 SITE DESCRIPTION

3.1 WATERSHED

The project site is located at 7302-7400 Center Avenue, the southeast corner of the intersection of Gothard Street and Center Avenue, within the City of Huntington Beach. Regionally, the project site is located in the Westminster Watershed which is part of the Santa Ana Region. This watershed covers 74.1 square miles in the southwestern corner of Orange County. Three main tributaries drain to this watershed. The Los Alamitos Channel drains into the San Gabriel River. The Bolsa Chica Channel empties into the Anaheim Bay-Huntington Harbour complex. The East Garden Grove-Wintersburg Channel drains through Bolsa Bay into Huntington Harbour.

303(d) LISTED WATER QUALITY LIMITED SEGMENTS

The project site ultimately discharges into the Garden Grove Wintersburg Channel, which discharges to the Bolsa Chica Reserve and ultimately to Huntington Harbour. The Garden Grove Wintersburg Channel, and Bolsa Chica Reserve are not listed as impaired on the 2006 303(d) list of Limited Water Quality Segments prepared by the Santa Ana RWQCB. However, Huntington Harbour further downstream is listed as impaired for chlordane, copper, lead, nickel, pathogens, PCBs, and sediment toxicity. Refer to Appendix F for the 2006 303(d) list for the Santa Ana region.

The primary pollutants of concern for the project site are, therefore, (1) bacteria/virus, (2) sediment, and (3) pesticides.

TMDLs

Currently, there are no TMDLs established for Huntington Harbour or any tributary drainage courses within the project area. Refer to Appendix F for the 2006 list of TMDLs in the Santa Ana region.

HYDROLOGIC CONCERNS

The purpose of this section is to identify any hydrologic conditions of concern with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. Hydrologic conditions of concern are typically directed to those developments that discharge directly into receiving water bodies (natural drainage courses or partially improved channels).

Runoff from the project site discharges onto the adjacent streets and into the city curb and gutter system. Runoff is then conveyed into the City MS4 system. None of the proposed runoff from the development will discharge directly into natural drainage courses or partially improved channels and therefore, hydrologic conditions of concern do not apply to the project. The project's pre- and post-development runoff conditions are nearly identical. For the above reasons, there will be no hydrologic conditions of concern for the proposed project.

3.2 SITE LOCATION

PLANNING AREA/ COMMUNITY NAME	AMSTAR / Red Oak Huntington Beach, LLC
GENERAL LOCATION	Located in the City of Huntington Beach, on the S/E corner of Center Avenue and Gothard Street. The site is surrounded by commercial facilities and adjacent to Golden West College. The Garden Grove Witnersburg Channel is located south of the project site.
ADDRESS	7302-7400 Center Avenue Huntington Beach, CA
ADJACENT LAND USES	Adjacent land uses include commercial and parking facilities to the north, south, and east
PROJECT SIZE	3.8 acres
PROJECT OWNER	AMSTAR / Red Oak Huntington Beach, LLC 2101 Business Center Drive, #230 Irvine, CA 92612 949.733.2000
WQMP PREPARER	Fuscoe Engineering, Inc. 16795 Von Karman, Suite 100 Irvine CA, 92606 949.474.1960
THOMAS BROS. MAP	Orange County, page 827, grid J05
WATERSHED	Westminster Watershed
ZONING	Commercial General

SOIL CHARACTERISTICS

A geotechnical study was performed for the site in April 2008 by Geocon Inland Empire, Inc. Soils within the vicinity of the project site generally consist of artificial fill materials; the fill is dark brown very fine grained sandy silt with traces of gravel and scattered construction debris. The surface fill underlain by alluvial soils, mainly silt, sandy silt, silty sand, and clay.

Depth to groundwater on the project site is between 5 and 10 feet below grade. One of the five borings conducted identified groundwater at a depth of 8ft below surface (northeast corner of the property). Groundwater, however, was not encountered in the other four borings performed throughout the project site, which bored down to 20.5 feet below ground surface. It is, however, anticipated that shallow groundwater will be present.

It should be mentioned that the site is anticipated to be raised 6-10 feet in elevation above existing grade via fill. Should infiltration practices be considered for the proposed project, further analysis will be required to determine if the groundwater table will be impacted at the location where such practices will be employed.

EXISTING DRAINAGE CONDITIONS

The project site currently consists of two commercial structures and concrete and asphalt paved underground parking lots. Currently all surface water sheet flows along the ground surface and enters the city curb and gutter system where it is then conveyed into the City MS4 approximately 1,200 ft south of the project site. The storm drain system connects to an existing City of Huntington Beach storm drain line, directing its flow to the Garden Grove Wintersburg Channel. The Garden Grove Wintersburg Channel ultimately drains to the Bolsa Chica Reserve, and ultimately discharges to the Huntington Harbour.

PROPOSED DRAINAGE CONDITIONS

The proposed site will contain two large mixed use buildings. The site will be residential and commercial units with an underground parking garage. See Section 6.0 WQMP Site Plan for location of facilities.

Roof drainage from the buildings will be collected via an area drain system and outlet onto the proposed emergency vehicle access (EVA) lane along the south perimeter of the site. The runoff with then sheet flow across the EVA lane to grate inlets located along the lane's southern edge. Storm water will then be conveyed easterly and discharge offsite via parkway drain. The runoff will continue and street flows along the curb and gutter of Gothard Street, and enters into the City MS4 system as in existing conditions. Low flow runoff from the project site will be diverted to a Stormfilter BMP for treatment prior to discharge off-site. Further details on the proposed treatment control BMPs are provided in Section 4.3.

3.3 EXISTING WATER QUALITY ISSUES

Prior to construction, approximately 95% of the site is impervious and the runoff coefficient is 0.86. After completion, the entire site will be approximately 73.65% impervious and the runoff coefficient will be 0.70.

According to the OC DAMP, there are no Environmentally Sensitive Areas (ESAs) within the vicinity of the project site. There are no pre-existing water quality issues identified for the site nor has there been any indication of past soil contamination since this area's development. If such problems are discovered at any stage of the project's redevelopment, activities will be suspended until the problem is mitigated.

4.0 BEST MANAGEMENT PRACTICES

The WQMP shall identify Best Management Practices (BMPs) that will be used on-site to control predictable pollutant runoff, and shall identify, at a minimum, the measures specified in the Countywide Water Quality Management Plan (WQMP) and NPDES Drainage Area Management Plan (DAMP), the assignment of long-term maintenance responsibilities (specifying the developer, parcel owner, maintenance association, lessee, etc.) and the locations of all structural BMPs.

Projects designated as Priority Projects are required to incorporate and implement site design, source control, and treatment control BMPs, unless not applicable due to the project characteristics. Site design BMPs help minimize the introduction or generation of potential pollutants from a facility's operations. Source control BMPs are operational practices that reduce potential pollutants at the source, and include both structural and routine non-structural practices. Treatment control BMPs remove pollutants of concern from storm water runoff and must be located and designed appropriately so as to infiltrate, filter, and/or treat the required runoff volume or flow prior to discharging into receiving waters. Selection of treatment control BMPs is based on the pollutants of concern of the project site (identified under Section 2.2) and the BMP's ability to effectively mitigate those pollutants, in consideration of site conditions and constraints. Further details on the Project's selected treatment control BMPs are provided in Section 4.3.

4.1 SITE DESIGN BMPs

The following table describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

TABLE 1. SITE DESIGN BMPs

DESIGN CONSIDERED:	YES	NO	DESCRIPTION
MINIMIZE DIRECTLY CONNECTED IMPERVIOUS AREAS (DCIAS) (C-FACTOR REDUCTION)	☒	☐	Roof runoff will discharge to landscaping, where feasible, prior to discharging off site into the City storm drain system.
CREATE REDUCED OR "ZERO DISCHARGE" AREAS (RUNOFF VOLUME REDUCTION)[1]	☒	☐	All areas will drain into vegetation before discharging offsite.
MINIMIZE IMPERVIOUS AREA/MAXIMIZE PERMEABILITY (C-FACTOR REDUCTION)[2]	☒	☐	The proposed project will reduce imperviousness of the project site from existing conditions by approximately 20%.

DESIGN CONSIDERED:	YES	NO	DESCRIPTION
CONSERVE NATURAL AREAS (C-FACTOR REDUCTION)	☐	☒	Not applicable. The project site is currently a developed with no natural areas to conserve. The proposed site will be developed as well.

1 Detention and retention areas incorporated into landscape design provide areas for retaining and detaining storm water flows, resulting in lower runoff rates and reductions in volume due to limited infiltration and evaporation. Such site design BMPs may reduce the size of treatment control BMPs.

2 The "C Factor" is a representation of a surface to produce runoff. Surfaces that produce higher volumes of runoff are represented by higher C Factors. By incorporating more pervious, lower C Factor surfaces into a development, lower volumes of runoff will be produced. Lower volumes and rates of runoff translate directly to lowering treatment requirements.

4.2 SOURCE CONTROL BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

TABLE 2. ROUTINE NON-STRUCTURAL BMPs

INCORPORATED ROUTINE NON-STRUCTURAL BMP:		YES	N/A	IF N/A, DESCRIBE WHY
N1	HOMEOWNER/ TENANT EDUCATION	☒	☐	
N2	ACTIVITY RESTRICTIONS	☒	☐	
N3	COMMON AREA LANDSCAPE MANAGEMENT	☒	☐	
N4	BMP MAINTENANCE	☒	☐	
N5	TITLE 22 CCR COMPLIANCE	☐	☒	Not applicable. The project site will not require Title 22 CCR compliance since the operation of the project site will not generate of hazardous wastes as part of its routine operation.
N6	LOCAL WATER QUALITY PERMIT COMPLIANCE	☐	☒	Neither the City of Huntington Beach nor the County of Orange issues water quality permits.
N7	SPILL CONTINGENCY PLAN	☐	☒	Not Applicable. This site does not mandate the stockpiling of cleanup materials; therefore, it does not require a spill contingency plan.
N8	UNDERGROUND STORAGE TANK COMPLIANCE	☐	☒	No underground storage tanks are approved or proposed for the site.

INCORPORATED ROUTINE NON-STRUCTURAL BMP:		YES	N/A	IF N/A, DESCRIBE WHY
N9	HAZ-MAT DISCLOSURE COMPLIANCE	☐	☒	Not applicable. The project site will not handle or dispose of hazardous materials as part of its routine operations.
N10	UNIFORM FIRE CODE IMPLEMENTATION	☐	☒	Not applicable. The project site will not handle or dispose of hazardous materials as part of its routine operations.
N11	COMMON AREA LITTER CONTROL	☒	☐	
N12	EMPLOYEE TRAINING	☒	☐	
N13	HOUSEKEEPING OF LOADING DOCKS	☒	☐	
N14	COMMON AREA CATCH BASIN INSPECTION	☐	☒	No catch basins are proposed for the project site.
N15	STREET SWEEPING PRIVATE STREETS AND PARKING LOTS	☒	☐	
N17[2]	RETAIL GASOLINE OUTLETS	☐	☒	No retail gasoline outlets are proposed for the site.

N1, Education for Property Owners, Tenants and Occupants

Tenants will be provided with storm water pollution prevention materials prior to occupancy. See Appendices C and D for owner/ tenant education materials. AMSTAR / Red Oak Huntington Beach, LLC shall be responsible for distributing educational materials on an annual basis and prior to occupancy.

N2, Activity Restrictions

Activity restrictions, such as prohibiting vehicle washing and maintenance, prohibiting discharge of fertilizer, pesticides, or animal wastes to streets or storm drains as well as any other activities that may potentially contribute to water pollution will be developed by the AMSTAR / Red Oak Huntington Beach, LLC.

N3, Common Area Landscape Management

Management programs will be designed and implemented by AMSTAR / Red Oak Huntington Beach, LLC to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the Owner and/or contractors.

[2] There is no BMP with the designation N16.

N4, BMP Maintenance

AMSTAR / Red Oak Huntington Beach, LLC will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors.

N11, Common Area Litter Control

AMSTAR / Red Oak Huntington Beach, LLC will be responsible for performing trash pick up and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations to the City for investigation.

N12, Employee Training

All employees of the Owner and any contractors of the City will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.

N13, Loading Docks

Loading docks or shipping/receiving areas will be kept clean and orderly as well as be regularly swept and litter removed. All cleanup procedure will minimize the use of water. If water is used it will be contained, collected, and disposed of in the approved manner. As mentioned previously, all loading areas will be located indoors and are not exposed to storm water runoff.

N15, Street Sweeping Private Streets and Parking Lots

AMSTAR / Red Oak Huntington Beach, LLC shall be responsible for the street sweeping of all drive aisles and parking areas within the project quarterly, and prior to the rainy season, no later than October 1st of each year.

TABLE 3. ROUTINE STRUCTURAL BMPS

INCORPORATED ROUTINE STRUCTURAL BMP:	YES	N/A	IF N/A, DESCRIBE WHY
PROVIDE STORM DRAIN STENCILING AND SIGNAGE	☐	☒	No storm drains exist on site.
DESIGN AND CONSTRUCT OUTDOOR MATERIAL STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION	☐	☒	There are no outdoor hazardous material storage areas proposed for the project site.
DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION	☐	☒	There are no outdoor trash storage areas proposed for the project site.
USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN	☒	☐	

INCORPORATED ROUTINE STRUCTURAL BMP:	YES	N/A	IF N/A, DESCRIBE WHY
PROTECT SLOPES AND CHANNELS AND PROVIDE ENERGY DISSIPATION	☐	☒	There are no proposed slopes or channels within the project site.
INCORPORATE REQUIREMENTS APPLICABLE TO INDIVIDUAL PROJECT FEATURES:			
A. DOCK AREAS	☐	☒	Dock areas are located within the building structure and not exposed to storm water.
B. MAINTENANCE BAYS	☐	☒	No maintenance bays are proposed for the site.
C. VEHICLE WASH AREAS	☐	☒	No vehicle wash areas are proposed for the site.
D. OUTDOOR PROCESSING AREAS	☐	☒	No equipment wash areas are proposed for the site.
E. EQUIPMENT WASH AREAS	☐	☒	No outdoor processing areas are proposed for the site.
F. FUELING AREAS	☐	☒	No fueling areas are proposed or approved for the site.
G. HILLSIDE LANDSCAPING	☐	☒	No hillside landscaping proposed for the site.
H. WASH WATER CONTROL FOR FOOD PREPARATION AREAS	☒	☐	
I. COMMUNITY CAR WASH RACKS	☐	☒	No car wash racks are proposed for the site.

Use Efficient Irrigation Systems and Landscape Design

AMSTAR / Red Oak Huntington Beach, LLC will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. AMSTAR / Red Oak Huntington Beach, LLC will be responsible for implementing all efficient irrigation systems for common area landscaping including but not limited to provisions for water sensors and programmable irrigation cycles. The irrigation systems shall be in conformance with water use efficiency guidelines.

Wash Water Controls for Food Preparation Areas

Any food establishments on the project site will have either contained areas, sinks, each with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes. If located outside, the contained areas, sinks shall also be structurally covered to prevent entry of storm water. Adequate signs shall be provided and appropriately placed stating the prohibition of discharging of wash water to the storm drain system.

4.3 TREATMENT CONTROL BMPs

The following table describes the treatment control BMPs that will be incorporated into this project. The treatment BMPs in this table are included in the project design to mitigate any pollutants of concern that were identified in the water quality planning process. The table also describes why a BMP was not chosen for the project. If necessary, details describing the design of the BMPs will be provided below.

The primary pollutants of concern for the project site are bacteria/virus, heavy metals, sediment, and pesticides.

TABLE 4. TREATMENT CONTROL BMPS

INCORPORATED TREATMENT CONTROL BMP:	YES	NO	IF NO, DESCRIBE WHY
VEGETATED (GRASS) STRIPS	☐	☒	Other treatment BMP chosen.
VEGETATED (GRASS) SWALES	☐	☒	Other treatment BMP chosen.
DRY DETENTION BASIN	☐	☒	Other treatment BMP chosen.
WET DETENTION BASIN	☐	☒	Other treatment BMP chosen.
CONSTRUCTED WETLAND	☐	☒	Other treatment BMP chosen.
DETENTION BASIN/SAND FILTER	☐	☒	Other treatment BMP chosen.
POROUS PAVEMENT DETENTION	☐	☒	Other treatment BMP chosen.
POROUS LANDSCAPE DETENTION	☐	☒	Other treatment BMP chosen.
INFILTRATION BASIN	☐	☒	Other treatment BMP chosen.
INFILTRATION TRENCH	☐	☒	Other treatment BMP chosen.
MEDIA FILTER	☒	☐	
PROPRIETARY CONTROL MEASURES	☐	☒	Other treatment BMP chosen.

Runoff from the project site will be mitigated through the use of an 8′ x 16′ precast Stormfilter manufactured by Contech Stormwater Solutions. The Stormfilter unit will be located at the southeast corner of the project site and has been appropriately size to treat the first-flush runoff from the project site. Sizing of the BMP is discussed below.

The table below lists the general pollutant removal efficiencies for Treatment Control BMP Categories (from the Orange County Model WQMP). The selected BMP type for the project is highlighted in grey.

TREATMENT CONTROL BMP SELECTION MATRIX								
	SEDIMENT/ TURBIDITY	NUTRIENTS	ORGANIC COMPOUNDS	TRASH & DEBRIS	OXYGEN DEMANDING SUBSTANCES	BACTERIA & VIRUSES	OIL AND GREASE	PESTICIDES
Biofilters / Vegetated Swales	**H/M**	L	U	L	L	U	**H/M**	U
Detention Basins[1]	M	M	U	M	M	U	M	U
Infiltration Basins[2]	**H/M**	**H/M**	U	U	**H/M**	**H/M**	U	U
Wet Ponds / Wetlands[3]	**H/M**	**H/M**	U	U	**H/M**	U	U	U
Sand Filter/ Filtration[4]	**H/M**	L/M	**H/M**	**H/M**	**H/M**	**H/M**	**H/M**	U
Water Quality Inlets	L	L	L	M	L	L	M	L
Hydrodynamic Separators[5]	**H/M***	L	L	**H/M**	L	L	L/M	L

Notes:
L: Low removal efficiency
M: Medium removal efficiency
H: High removal efficiency
U: Unknown removal efficiency
* L for turbidity

1 Includes extended/dry detention basins with 36-48-hour drawdown time
2 Includes infiltration basins, infiltration trenches, and porous pavements
3 Includes permanent pool wet ponds and constructed wetlands
4 Includes media filters
5 Also known as hydrodynamic devices, baffle boxes, swirl concentrators, or cyclone separators

Source: Excerpted, with minor revision, from the Orange County Model Water Quality Management Plan. September 26, 2003.

TREATMENT BMP: 8'x 16' PRECAST STORMFILTER

A StormFilter Unit is a pre-cast vault storm drain insert system that uses passive, siphon-activated media-filled cartridges that trap and adsorb particulates and pollutants. Runoff flows through the filter cartridges containing media and collects in the center of the cartridge for discharge, and flow separators trap floating debris and material. During a storm, runoff passes through the filtration media and starts filling the cartridge center tube. Air below the hood is purged through a one-way check valve as the water rises. When water reaches the top of the float, buoyant forces pull the float free and allow filtered water to drain. After storm, the water level in the structure starts to decline. A hanging water column remains under the cartridge hood until the water level reaches the scrubbing regulators. Air then rushes through the regulators releasing water and creating air bubbles that agitate the surface of the filter media, causing accumulated sediment to drop to the vault floor. Each cartridge can treat approximately 0.033 cfs of storm water runoff.

Media types include perlite, zeolite, granular activated carbon, CSF Leaf Media® and MetalRx™. Targeted pollutants include TSS, oil & grease, soluble metals, nutrients, organics, and trash and debris. StormFilters are effective at treating suspended solids (80%), phosphorous (62%), dissolved metals (40-60%), bacteria indicators (50-75%), as well as oils and grease and pollutants attached to sediments.

One StormFilter unit is proposed for the site, which will be located at the southwest corner of the property, under the EVA lane.

In accordance to the Countywide Model WQMP, the treatment BMP will be sized to treat the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour for each hour of a storm event, as determined from the local historical rainfall record. This is termed the Stormwater Quality Design Flow. The Stormwater Quality Design Flow (SQDF), is thus determined by the following equation:

$$SQDF = C * I * A_{TOTAL};$$

Where: C = coefficient of runoff (see Appendix A)
I = 0.2
A_{TOTAL} = total area to be treated

The calculations are provided in the table below. Additional information is provided in Appendix A.

SQDF[1] SUMMARY – STORMFILTER				
BMP Name	Runoff Coefficient	Rainfall Intensity[2] (in)	Treatment Area (acres)	SQDF (cfs)
Stormfilter	0.70	0.2	3.8	0.532

(1) Calculations are based on Per Orange County Drainage Area Management Plan (DAMP), Table A-1, Exhibit 7.11 – Attachment A.
(2) The intensity is 0.2 inches per hour, per OC DAMP.

Based on the treatment requirements set forth in the Orange County DAMP, the Stormfilter must be sized to treat 0.532 cfs of storm water runoff. Correspondingly, the table below indicates that the treatment BMP for the proposed project is sized to treat 0.561cfs.

SUMMARY OF TREATMENT BMP SIZING		
BMP NAME	DIMENSIONS	TREATMENT DESIGN CAPACITY
Stormfilter	8'x 16' precast 17 cartridges	0.561 cfs

5.0 BMP INSPECTION & MAINTENANCE (O&M PLAN)

It has been determined that AMSTAR / Red Oak Huntington Beach, LLC shall assume all BMP inspection and maintenance responsibilities for The Ripcurl Development located at 7302-7400 Center Avenue, Huntington Beach, CA in the City of Huntington Beach, CA.

CONTACT NAME	Alex Wong
TITLE	Development Manager
COMPANY	AMSTAR / Red Oak Huntington Beach, LLC
ADDRESS	2101 Business Center Drive, #230 Irvine, Ca 92612
PHONE	949.733.2000

Should the maintenance responsibility be transferred at any time during the operational life of The Ripcurl Development such as when an HOA or POA is formed for a project, a formal Notice of Transfer of Responsibility (see Appendix B) shall be submitted to the City of Huntington Beach at the time responsibility of the property subject to this WQMP is transferred. The Transfer of Responsibility shall be incorporated into this WQMP as an amendment.

ANNUAL CERTIFICATION OF BMP MAINTENANCE

AMSTAR / Red Oak Huntington Beach, LLC shall verify BMP implementation and ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. The certification shall verify that, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer / early fall, prior to the start of the rainy season. The form that will be used to record implementation, maintenance, and inspection of BMPs is included in Appendix E.

The City of Huntington Beach may conduct verifications to assure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP is taking place at the project site. The Owner shall retain operations, inspections and maintenance records of these BMPs and they will be made available to the City or County upon request. All records must be maintained for at least five (5) years after the recorded inspection date for the lifetime of the project.

LONG-TERM FUNDING FOR BMP MAINTENANCE

Long-term funding for BMP maintenance shall be funded by AMSTAR / Red Oak Huntington Beach, LLC.

ACCESS EASEMENT FOR CITY/COUNTY INSPECTION

Not applicable.

5.1 MAINTENANCE OF SOURCE CONTROLS (O&M PLAN)

The post development BMP maintenance responsibility and frequency matrices provided in this section detail the specific party to perform the inspection and maintenance of each BMP for The Ripcurl Development and details the maintenance and inspection activities to be performed, and the frequency with which each shall be performed.

NON-STRUCTURAL BMPs		RESPONSIBLE PARTY	MINIMUM MAINTENANCE FREQUENCY
N1	HOMEOWNER/ TENANT EDUCATION	AMSTAR / Red Oak Huntington Beach, LLC	Materials shall be provided to the employees that include general housekeeping practices and BMPs. Training and education programs must be provided to all new employees within 6 months of hire date and annually thereafter. Frequency: Annually
N2	ACTIVITY RESTRICTIONS	AMSTAR / Red Oak Huntington Beach, LLC	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Frequency: Ongoing
N3	COMMON AREA LANDSCAPE MANAGEMENT	AMSTAR / Red Oak Huntington Beach, LLC	Maintenance shall be consistent with City of Huntington Beach Landscape Water Efficiency Landscape Requirements (Municipal Code Chapter 14.52), plus fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (Appendix G). Frequency: Monthly
N4	BMP MAINTENANCE	AMSTAR / Red Oak Huntington Beach, LLC	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the Owner and shall be available for review upon request. Frequency: Ongoing

NON-STRUCTURAL BMPs		RESPONSIBLE PARTY	MINIMUM MAINTENANCE FREQUENCY
N11	COMMON AREA LITTER CONTROL	AMSTAR / Red Oak Huntington Beach, LLC	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Frequency: Monthly
N12	EMPLOYEE TRAINING	AMSTAR / Red Oak Huntington Beach, LLC	The owner shall educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Frequency: Annually
N15	STREET SWEEPING PRIVATE STREETS AND PARKING LOTS	AMSTAR / Red Oak Huntington Beach, LLC	Parking lots and the EVA lane must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1st). Frequency: Quarterly

STRUCTURAL BMPs	RESPONSIBLE PARTY	MINIMUM MAINTENANCE FREQUENCY
USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN	AMSTAR / Red Oak Huntington Beach, LLC	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, and day or night time temperatures. Frequency: Monthly

5.2 MAINTENANCE OF TREATMENT CONTROLS

The post development BMP maintenance responsibility and frequency matrix provided in this section detail the specific party to perform the inspection and maintenance of each BMP for The Ripcurl Development and details the maintenance and inspection activities to be performed, and the frequency with which each shall be performed.

TREATMENT BMPs	RESPONSIBLE PARTY	MINIMUM MAINTENANCE FREQUENCY
8' X 16' PRECAST STORMFILTER	AMSTAR / Red Oak Huntington Beach, LLC	During the rainy season (October 1 to April 30), the unit should be inspected monthly or prior to a target storm, and annually in May, and cleaned out once per year at a minimum. More frequent inspection throughout the first year of installation are essential to determine the annual loading patterns and confirm suggested maintenance schedule. Cartridges should be replaced on an as-needed basis, at a minimum of once every two years. Manufacturer's specifications may recommend additional maintenance. Minimum Frequency: MANUFACTURER'S RECOMMENDATIONS

Additional maintenance guidelines for Stormfilter can be found in Appendix C of this preliminary WQMP.

6.0 LOCATION MAP, SITE PLAN, AND BMP DETAILS

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

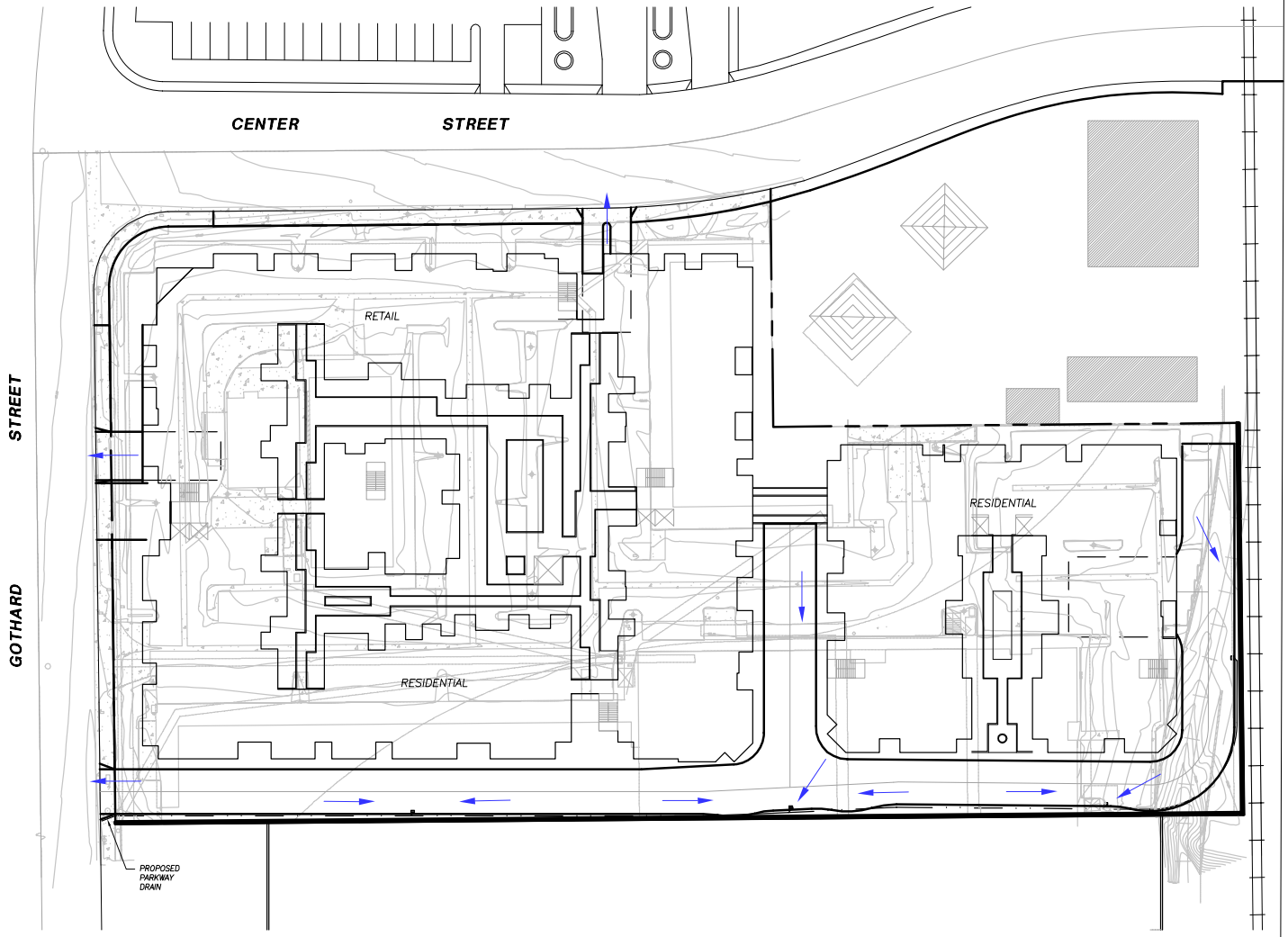
PLOT PLANS

- Exhibit 1 Vicinity Map
- Exhibit 2 Site Plan Exhibit
- Exhibit 3 WQMP Exhibit

BMP DETAILS

- 8' x 16' Precast Stormfilter Standard Details

VICINITY MAP



LEGEND

PROJECT BOUNDARY

FLOW DIRECTION

GRAPHIC SCALE

60 0 30 60 120

(IN FEET)
1 inch = 60ft.

FUSCOE ENGINEERING

Scale: 1" = 60'
Exhibit Date: 5-02-08

SITE PLAN
RIP CURL DEVELOPMENT
Huntington Beach, CA

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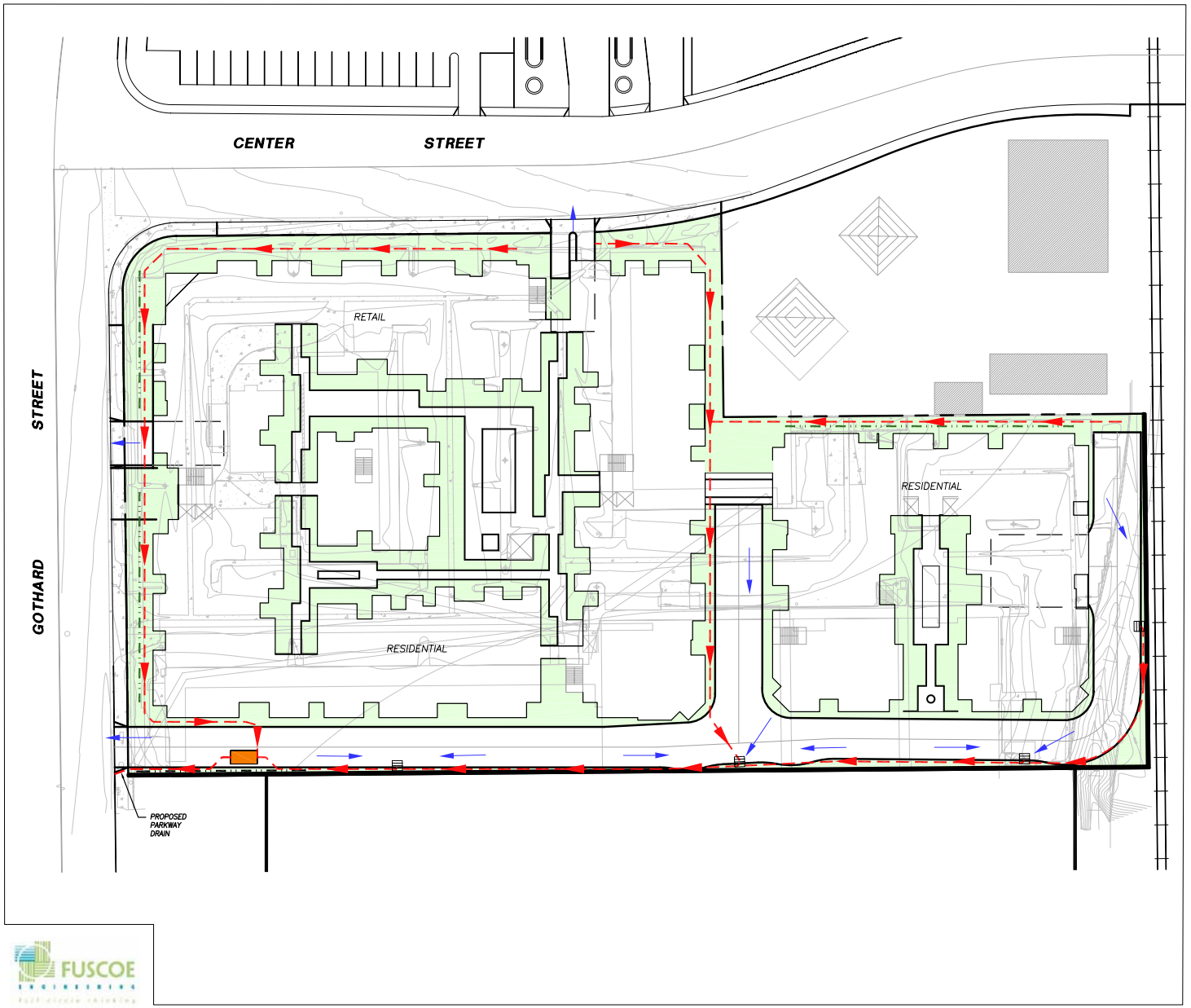

LEGEND

- PROJECT BOUNDARY
- COMMON AREA LANDSCAPE MANAGEMENT EFFICIENT IRRIGATION SYSTEMS & LANDSCAPING DESIGN
- BIO-SWALE
- ADREA DRAIN PIPE
- FLOW DIRECTION
- 8' X 16' PRECAST STORMFILTER

GRAPHIC SCALE

60 0 30 60 120

(IN FEET)
1 inch = 60ft.

FUSCOE ENGINEERING

Scale: 1" = 60'
Exhibit Date: 6-5-08

WATER QUALITY MANAGEMENT PLAN
RIP CURL DEVELOPMENT
Huntington Beach, CA

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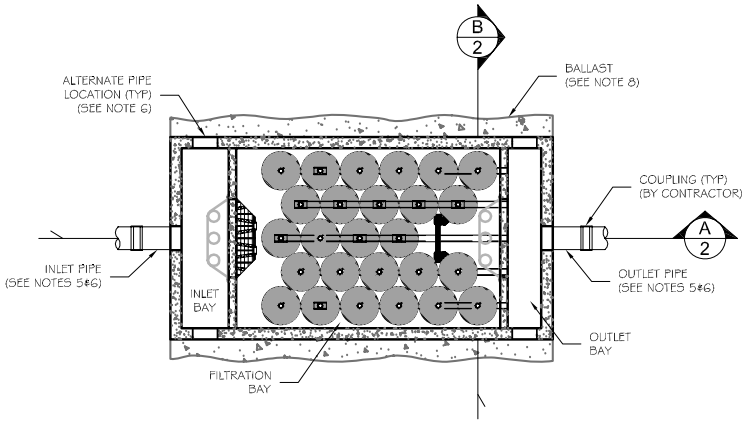
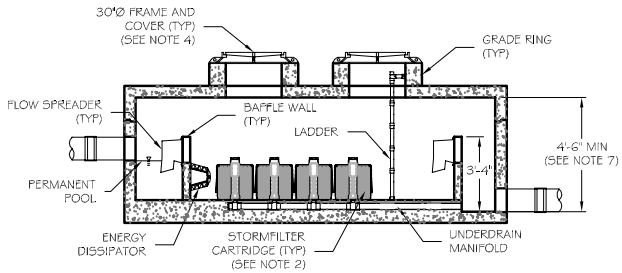


8' x 16' STORMFILTER - PLAN VIEW (1/1)



8' x 16' STORMFILTER - SECTION VIEW (A/1)

THE STORMWATER MANAGEMENT StormFilter® U.S. PATENT No. 5,322,629, No. 5,707,527, No. 6,027,639 No. 6,649,048, No. 5,624,576, AND OTHER U.S. AND FOREIGN PATENTS PENDING

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CONTECH STORMWATER SOLUTIONS
contechstormwater.com

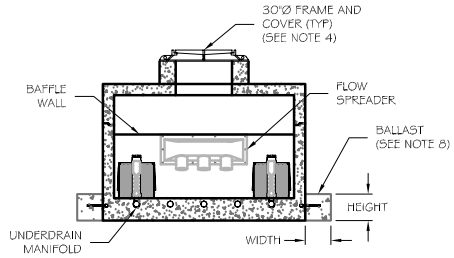
8' x 16' PRECAST STORMFILTER
PLAN AND SECTION VIEWS
STANDARD DETAIL

DRAWING 1 1/2

DATE: 09/29/05 | SCALE: NONE | FILE NAME: SF816-PC-DTL | DRAWN: MJW | CHECKED: ARG

GENERAL NOTES

1) STORMFILTER BY CONTECH STORMWATER SOLUTIONS; PORTLAND, OR (800) 548-4667; SCARBOROUGH, ME (877) 907-8676; ELKRIDGE, MD (866) 740-3318.
2) FILTER CARTRIDGE(S) TO BE SIPHON-ACTUATED AND SELF-CLEANING. STANDARD DETAIL DRAWING SHOWS MAXIMUM NUMBER OF CARTRIDGES. ACTUAL NUMBER REQUIRED TO BE SPECIFIED ON SITE PLANS OR IN DATA TABLE BELOW.
3) PRECAST VAULT TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C857 AND C858. DETAIL DRAWING REFLECTS DESIGN INTENT ONLY. ACTUAL DIMENSIONS AND CONFIGURATION OF STRUCTURE WILL BE SHOWN ON PRODUCTION SHOP DRAWING.
4) STRUCTURE AND ACCESS COVERS TO MEET AASHTO H-20 LOAD RATING.
5) STORMFILTER REQUIRES 2.3 FEET OF DROP FROM INLET TO OUTLET. IF LESS DROP IS AVAILABLE, CONTACT CONTECH STORMWATER SOLUTIONS.
6) INLET AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR. PRECAST STORMFILTER VAULT EQUIPPED WITH EITHER CORED OPENINGS OR KNOCKOUTS AT INLET AND OUTLET LOCATIONS.
7) PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS. IF A SHALLOWER SYSTEM IS REQUIRED, CONTACT CONTECH STORMWATER SOLUTIONS FOR OTHER OPTIONS.
8) ANTI-FLOTATION BALLAST TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR, IF REQUIRED. BALLAST TO BE SET ALONG ENTIRE LENGTH OF BOTH SIDES OF THE STRUCTURE.
9) ALL STORMFILTERS REQUIRE REGULAR MAINTENANCE. REFER TO OPERATION AND MAINTENANCE GUIDELINES FOR MORE INFORMATION.



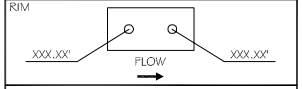
8' x 16' STORMFILTER - SECTION VIEW (B/2)

8' x 16' PRECAST STORMFILTER DATA

STRUCTURE ID	XXX
WATER QUALITY FLOW RATE (cfs)	X.XX
PEAK FLOW RATE (cfs)	X.XX
RETURN PERIOD OF PEAK FLOW (yrs)	XXX
# OF CARTRIDGES REQUIRED	XX
CARTRIDGE FLOW RATE (15 OR 7.5 gpm)	XX
MEDIA TYPE (CSF, PERLITE, ZPG)	XXXXX

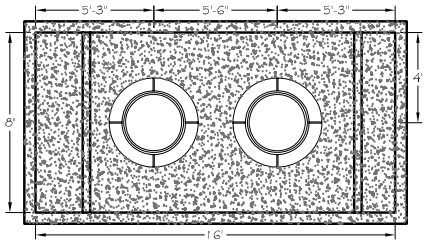
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	XXX.XX'	XXX	XX"
INLET PIPE #2	XXX.XX'	XXX	XX"
OUTLET PIPE	XXX.XX'	XXX	XX"

RIM



LADDER		YES/NO
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	XX"	XX"

NOTES/SPECIAL REQUIREMENTS:



8' x 16' STORMFILTER - TOP VIEW (1/2)

THE STORMWATER MANAGEMENT StormFilter® U.S. PATENT No. 5,322,629, No. 5,707,527, No. 6,027,639 No. 6,649,048, No. 5,624,576, AND OTHER U.S. AND FOREIGN PATENTS PENDING

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contechstormwater.com

8' x 16' PRECAST STORMFILTER
TOP AND SECTION VIEWS, NOTES AND DATA
STANDARD DETAIL

DRAWING 2 2/2

DATE: 09/29/05 | SCALE: NONE | FILE NAME: SF816-PC-DTL | DRAWN: MJW | CHECKED: ARG

FUSCOE ENGINEERING

WATER QUALITY MANAGEMENT PLAN
RIP CURL DEVELOPMENT
Huntington Beach, CA

7.0 EDUCATIONAL MATERIALS

The educational materials included in this WQMP are provided to inform people involved in future uses, activities, or ownership of the site about the potential pitfalls associated with careless storm water management. "The Ocean Begins at Your Front Door" provides users with information about storm water that is/ will be generated on site, what happens when water enters a storm drain, and its ultimate fate, discharging into the ocean. Also included are activities guidelines, such as "Tips for Landscape & Gardening", to educate anyone who is or will be associated with activities that have a potential to impact storm water runoff quality. These guidelines generally provide a menu of BMPs to effectively reduce the generation of storm water runoff pollutants from a variety of activities.

BROCHURES

- The Ocean Begins at Your Front Door
- Tips for Landscaping and Gardening
- Tips for Using Concrete and Mortar
- Sewage Spill Reference Guide
- Waste Oil Collection Centers for North OC
- Proper Maintenance Practices for your Business

OTHER DOCUMENTS

- SD-10 Site Design & Landscape Planning
- SD-12 Efficient Irrigation
- SD-13 Storm Drain Signage

[*The above listed Orange County Stormwater Program brochures and BMP Fact Sheets will be provided in the Final WQMP for The Ripcurl Development project*]

City of Huntington Beach

Preliminary Hydrology Report

for

The Ripcurl Project

July 2008

Prepared by:

PBS&J®

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Los Angeles, CA 90025
310.268.8132

1.0 Introduction

The purpose of this Preliminary Hydrology Report is to provide information related to tributary and project site runoff contributions to the off-site stormwater conveyance capacity of the local drainage system.

1.1 Background

The City of Huntington Beach Master Plan of Drainage (MPD) identified stormwater conveyance capacity constraints along Gothard Street adjacent to, and down gradient from, the project site. The MPD indicates that the required improvements include an underground pipeline to convey 8 to 11 cubic feet per second (cfs) of stormwater along Gothard Street, from Center Avenue to Edinger Avenue. This underground pipe would be a 2-foot pipe at Center Avenue and transition to a 2.5-foot pipe by Edinger Avenue, where it would connect to the existing underground storm drain pipe in Edinger Avenue at Gothard Street, or an improved storm drain pipe in Edinger Avenue at Gothard Street.

1.2 Project Site and Study Area

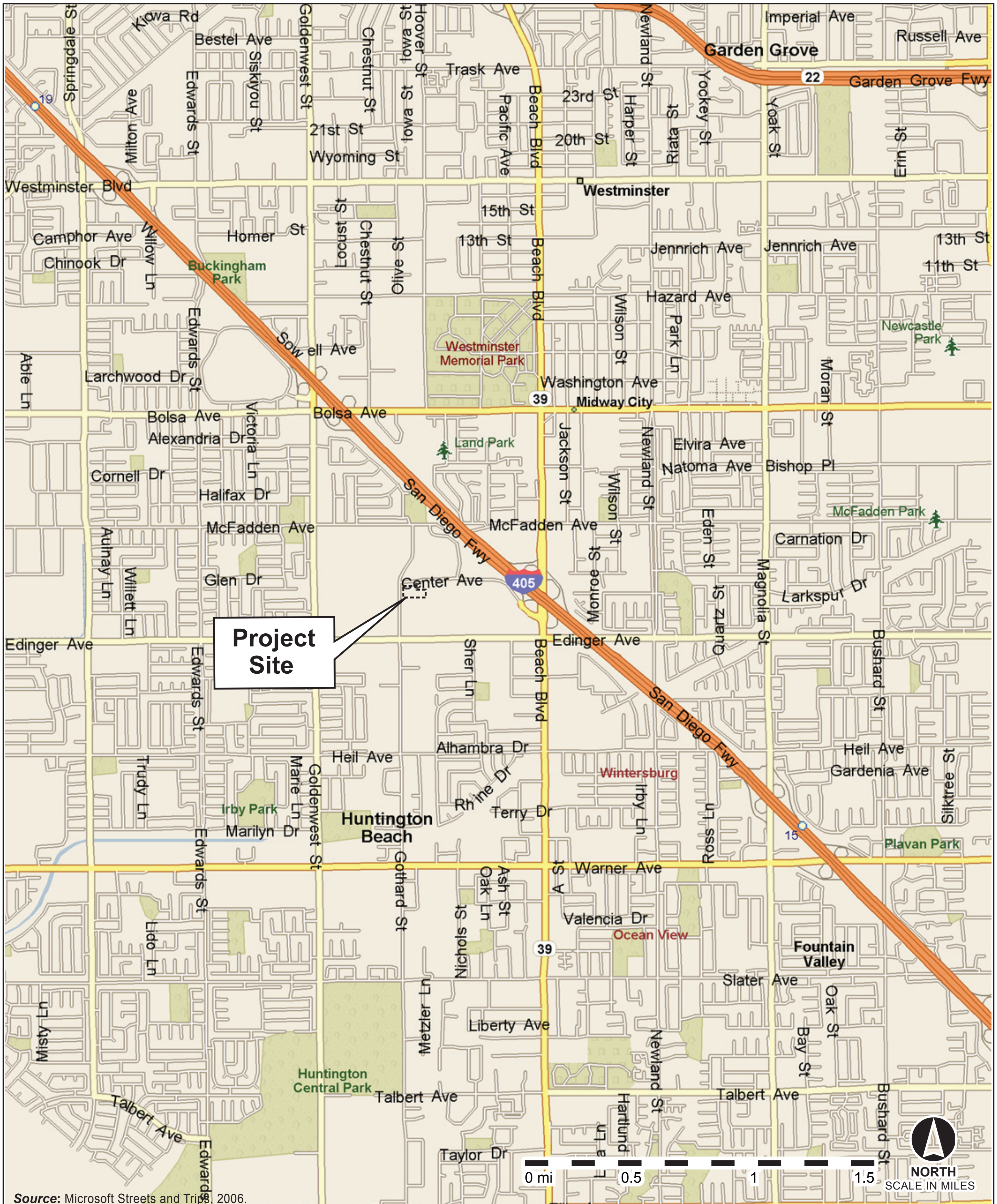
The proposed project is located at 7302-7400 Center Avenue in the northeastern portion of the City of Huntington Beach in western Orange County, California (Figure 1 – Site and Vicinity). The commercially-developed 3.8-acre site is bordered by Center Avenue to the north; an existing commercial property to the south; Gothard Street to the west; and the Union Pacific Railroad (UPRR) right-of-way, commercial property, and the proposed Village at Bella Terra site to the east.

The entire subcatchment draining along Gothard Street to Edinger Avenue (MPD catchment 80200 through 80206) was modeled to determine potential street flow capacity constraints for the design storm events (see Table 1 – Street Flow Design Standards, below in Section 2). The project site is located within the City MPD catchment 80205.

The tributary watersheds (catchments) contributing to street flow in Gothard Street are shown in Figure 2 – Study Area. The majority of catchments are built out with commercial uses in accordance with the City's General Plan. However, in the catchments north of Center Avenue (MPD numbers 80200 through 80204), areas that are zoned for Industrial General and Residential Low Density, have not been developed and are currently vacant. Additionally, the area north of the eastern portion of the project site is zoned for Commercial General, but currently supports aerial transmission towers and a few structures. Consequently, the existing study area has less development and less impervious surfaces compared to the potential amount of impervious surfaces under the City's General Plan.

The existing project site is currently developed with commercial uses, and surface drainage flows primarily as on-site local street/driveway flow to Gothard Street. Development under the proposed project would be mixed-use including commercial retail and restaurant uses and high density residential. Surface drainage for the proposed project would be routed to the emergency vehicle access (EVA) lane along the southern and eastern boundary of the project site and into an underground storm drain system through grated inlets. The underground storm drain system would flow to the Gothard Street parkway. The area north of the eastern portion of the project site, where aerial towers are located, is not included as part of the project site.

Details on the project site and study area characteristics used in the models are provided in Section 2.2.2 – Study Area Characteristics.



Source: Microsoft Streets and Trips, 2006.

PBS&J

FIGURE **1**

Site and Vicinity Location Map

0D2138700

The Ripcurl

03002 | JCS | 08

Source: PBS&J, 2006.

FIGURE **2**

Study Area

Catchment Boundaries

Catchment Number 80200

0D2138700

The Ripcurl

03002 | JCS | 08

2.0 Methods

Peak storm flows rates from the study area, including the project site, were modeled to determine the existing Gothard Street flow rates and to estimate potential system capacity exceedences for the design storm events. Peak flow rates for the study area were also modeled with implementation of the proposed project to estimate the proposed project contributions to peak flow rates in Gothard Street and/or exceedence conditions. The main differences between the existing project site and the proposed project drainage characteristics that were used in the model are summarized below (see Figure C.3 of the Appendices for details):

1. Longer flow path length for proposed project because of routing through on-site storm drain system and EVA lane.

2. Steeper slope for proposed project, based on the Preliminary Grading Plan (PGP), slopes through the local on-site drainage and underground storm drain pipes.

No changes in the amount of impervious surface area were assumed. It is likely the proposed project will have increased pervious area; therefore, it was assumed that the same amount of impervious area provides for a more conservative estimate of potential proposed project impacts.

The study area models were populated with available data that included a typical cross section and slopes of Gothard Street presented in, “Plan and Profile Gothard Street North of Edinger Avenue” dated 26, March 1963 (included in Appendix G), the MPD typical arterial highway cross-section data, and 1-meter DEM (digital elevation model). No other as-built plans for Gothard Street from Edinger Avenue to McFadden Avenue were available.

Drainage basin and catchment boundaries were developed using the MPD Catchments available as a GIS file from the City. Catchment 80205, where the project site is located, was split into Catchment 802055 and 80205 to better separate out contributions of the project site to overall street flow. Areas were then determined based on the City GIS data set for the study area.

The hydrology model was computed for the study area using the Advanced Engineering Software (AES) program package (2007). Hydrological model development followed the Orange County Hydrology Manual methodology (1986) and design standards for street flow characteristics and capacities followed the MPD and Orange County Local Drainage Manual (1996).

Details on study area characteristics are described in Section 2.2.2 – Study Area Characteristics. Specific input values used in the models are provided in Appendix A – Existing Conditions Models, Appendix B – General Plan Build-Out Models, and in Appendix C – Study Area Characteristics.

2.1 Scenarios

Because of the potentially substantial difference between the existing study area characteristics and build-out of the General Plan (development of currently vacant areas), two hydrological scenarios were analyzed for study area baseline conditions:

1. Existing conditions

2. Build-out of the General Plan

The General Plan build-out was modeled because this provides information on the required maximum capacity in the system when all upstream properties are developed per their current land use classification. The majority of the properties upstream from the project site are currently primarily undeveloped (see Figure 2). Also, if capacity exceedences are identified, and storm drain system

improvements are needed for mitigation of the developments, impacts for the interim condition improvements will be sized for the full build-out condition.

Two hydrological scenarios were then analyzed for each baseline condition to determine project site contributions to baseline conditions:

a. Existing project site

b. Proposed project

Four storm events corresponding to the City street flow design standards, based on allowable flow depths (Table 1 – Street Flow Design Standards), were modeled to determine existing street flows and constraints.

Table 1: Street Flow Design Standards

Storm Event	Allowable Storm Flow Standard
10-year	One travel lane free in each direction, or at least 12 feet free in each direction
25-year	Not to exceed height of the curb
50-year	Not to exceed 0.2 feet above the curb
100-year	Not to exceed 0.5 feet above the curb
All storm events	The product of flow depth and flow velocity shall not exceed 6 feet^2/second

Source: Master Plan of Drainage. Citywide Urban Runoff Management Plan Section 4: Drainage Element. January 2005, p. 4-46.

2.2 Rational Method Model

Conveyance capacity and street flow rates were assessed using the OCFCD-approved AES program Rational Method Street flow analysis through the catchment subareas with County of Orange default parameters.

To determine peak flow rates, the initial subarea time of concentration (Tc) is often the most significant factor leading to the Tc computation of a watershed. The Kirpich formula relates an initial subarea Tc to subarea slope and development type. It is assumed that overland flow effects dominate the travel time hydraulics of the initial subarea. The data required for the initial subarea Tc calculation are: upstream elevation, downstream elevation, initial subarea flow-length, soil type, development type, and area.

The data needed for street flow travel time computations can be divided into two groups: street flow hydraulic data and subarea runoff data. The specific data and sources are summarized in Section 2.2.2. In addition to the upstream elevation, downstream elevation, street length, symmetrical street half width (from crown to top of parkway) and curb height and other hydraulic information including the half-street section crossfalls are required. The second group of data describes the tributary subarea runoff characteristics. The needed information includes soil type, development type, and subarea acreage.

An iterative process is used to estimate the peak flow rate through the subarea until a stable mean value is determined. Based on the estimated peak flow rate, the normal street depth and velocity is calculated using Manning's Equation. When street flow depths exceed the top of curb, flow is modeled as channel flow through the street and parkway. Flow is contained within the street and parkway resulting in a conservative calculation of depth. The street flow travel time is then calculated and added to the upstream Tc to obtain the Tc at the downstream point of concentration. The end-of-the-subarea peak flow

rate and corresponding street flow hydraulic data (i.e., depth, velocity, and others) are then calculated based on the downstream peak flow rate.[1]

Time of concentration may be lower for a further down-gradient street section compared to an up-gradient street section where another tributary system is confluenced with the main street. This is because travel times for flow from the confluenced system and in the main streets may result in less area contributing to peak street flow than the total area ('effective area') and shorter travel times for the highest convergence of peak flow rates.

Flows were modeled as street flow for the study area, except for the project site contributions. Project site contributions were added as a confluence area[2] to the node on the up-gradient side of the project site. Adding the project site as a contributing area that confluences with the street model allows for an assessment of changes to project site drainage based on the Preliminary Grading Plan. Adding these contributions to the top of the drainage area allows for a conservative (worst case) assessment of potential project contributions.

2.2.1 Study Area Model

The study area model flow schematic is included in Appendixes A and B for existing and General Plan build out conditions, respectively. Model input and structure is also included in the detailed output reports for all modeled conditions and design storm events

1. Existing Conditions
    - a. Existing project site
    - b. Proposed project
2. General Plan Build Out
    - a. Existing project site
    - b. Proposed project

2.2.2 Study Area Characteristics

No measurements for existing impervious area or proposed project impervious area were available for the analysis. Therefore, both the existing and proposed project amount of impervious surfaces on the project site was estimated to be 90 percent of the surface area, which is the standard amount used for commercial land uses within the County of Orange in accordance with the County Hydrology Manual methodology (1986). Existing flow path length was estimated based on the underlying existing site topography as presented in the Preliminary Grading Plan and assuming an overall flat slope because exact contour elevations were not available. Proposed project flow slope was identified on, and measured from, the Preliminary Grading Plan dated June 4, 2008.

In accordance with the County Hydrology Manual methodology, soils within this area are classified as Hydrologic Group C. Land use for impervious fraction determination was classified based on the General

[1] Williamson and Schmid, Civil Engineers, Irvine, California. Orange County Hydrology Workbook. September 1987. p.1.

[2] The AES model models street flow using a street flow function with a contributing area. Modification of parameters such as the slope and slope length are not included in the street flow function. However, the project site can be added as a separate area that drains into (confluences with) the street flow function system.

Plan designation and aerial photography. Commercial General lands were classified as commercial land use in the model. Industrial General land was the UPRR right-of-way. Because this has a low amount of impervious surfaces compared to typical industrial lands, this area was classified as a grassed area with poor coverage. Additionally, existing vacant lands were classified as grassed areas with poor coverage and the area north of the eastern portion of the project site (with the aerial towers and few buildings) was classified as commercial, but with an impervious fraction of 0.25 instead of the default impervious fraction of 0.90.

AES program land use categories were used to define land cover characteristics. Land use was classified as “Commercial” for all IG and CG lands. RL was classified as “Residential 5-7 Dwelling Units per Acre.” The UPRR right-of-way was classified as “grass, poor cover”. The northeast corner of catchment 802055 (tower property) was classified as “Commercial” but the amount of impervious surfaces was adjusted to be 25 percent. For existing conditions, the vacant lands north of Center Avenue were all classified as “grass, poor cover”. Study area characteristics are shown on Figure A.1 for existing conditions and Figure B.1 for General Plan build-out conditions.

Appendix C contains details on study area characteristics used in the street flow hydrology model. Soils within the study area are classified as Hydrologic Group C (see Figure C.1 of the Appendices). Hydrologic Groups range from A to D, with A soils having the lowest runoff potential and D soils having the greatest runoff potential.

DEMs were used to approximate elevations for determining slopes (see Figure C.2 of the Appendices). It should be noted that the 1-meter DEMs are a coarse scale and not suitable for determining small changes in elevation. Therefore, for determining road slopes, larger areas were averaged when using DEMs as the elevation source; nodes 10 to 50 used an average slope for Gothard Street. Gothard Street adjacent to the project site used elevation data available on the Preliminary Grading Plan. A larger grade drop of 0.003 ft/ft was measured just down gradient of the project site to node 60 (MPD node 80206). The DEM measured overall slope for the portion of Gothard Street in catchment 80206 was similar to the slope indicated on the “as-built” drawings for Gothard Street near the intersection with Edinger Avenue (0.0016 ft/ft compared to 0.0013 ft/ft) and was therefore considered a reasonable representation of this lower portion of Gothard Street.

Project site characteristic were determined based on the Preliminary Grading Plan (see Figure C.3 of the Appendices). General Plan build-out conditions were determined based on the existing General Plan (see Figure C.4 of the Appendices). A summary of data and sources is included in Table 2.

Table 2: Model Data Sources

Street Flow Hydraulics		Subarea Run-off	
Elevation	node 10-50:DEM node 50-55: preliminary grading plan node 55-70: DEM node 70: DEM confirmed with as-builts	**Soil Type**	Hydrologic Group C, per soil map (Appendix C.1)
Street half width	32 feet, per as-builts	**Development Type**	General Plan Zonning (see Appendix C.4)
Curb height	0.67 feet, per as-builts	**Subarea Acreage**	City GIS (see Appendix C.5)
		Project Flow Path	Site grading (see Appendix C.3)

2.3 Street Flow Design Capacity

The street flow design capacity was determined based on the symmetrical street cross-section for Gothard Street and MPD cross-section characteristics for a secondary arterial highway (this has the same overall width as the cross-section on the 1983 “Plan and Profile Gothard Street North of Edinger

Avenue"). The AES program Hydraulic Elements analysis for symmetrical street flow was used to calculate the flow rate for street flow depths of 0.475 feet (street flood width about 20 ft, therefore, 1 travel lane free) and 0.67 feet (top of curb) corresponding to the 10-year and 25-year design storm events. This module is not suitable for determining the design capacity for larger storm events because it does not calculate parkway flow.

Design street flow capacity flow rates for the 50-year and 100-year storm events were not determined and were left as not to exceed the allowable depth above the curb. When the flows were modeled as channel flow constrained over the street and parkway, the street flow depths did not exceed the design depths of 0.87 feet for the 50-year storm event, and 1.17 feet for the 100-year storm event. Even the 100-year storm event did not exceed the 50-year design capacity. Consequently, the maximum street flow capacity flow rate for the 50-year and 100-year storm events was not defined. Table 2 lists the street flow design capacity used in the analysis of conveyance capacity for Gothard Street (see Figure C.5 of the Appendices for the study area section of the MPD and Appendix D for AES program calculations).

Table 3: Street Flow Design Capacity for Design Storm Events

Nodes	Slope (ft/ft)	10-year (cfs)	25-year (cfs)	50-year (ft depth)	100-year (ft depth)
10 to 50	0.000158	5.47	15.40	0.87	1.17
50 to 55	0.0017	5.70	16.04	0.87	1.17
55 to 60[a]	0.003	7.57	21.31	0.87	1.17
60 to 70	0.0016	5.53	15.56	0.87	1.17

[a] The higher slope within this section results in a higher street flow capacity because stormwater can travel through the area at a faster rate.
SOURCE: PBS&J 2008

2.4 Project Site Contributions

Project site contributions to peak flow rates were evaluated at node 50, at the northwestern corner of the project site. Project site contributions were added to the upper node in order to provide a more conservative (worst case) assessment of effects on peak street flow, as is typically done in hydrology and hydraulic studies. Project site contributions to exceedence of street flow design capacity were based on the project site's proportion of the peak flow in the adjacent street section.

The initial project site slope was assumed to be the same as the adjacent street grade; no detailed information was available. The proposed project site slope was assumed to be one percent, as noted on the street and drain path grades on the Preliminary Grading Plan (2008). The longest flow path lengths were measured using the Preliminary Grading Plan (see Figure C.3 - Project Site Characteristics of the Appendices).

The mitigation flow rate was determined based on the project site contributions to the street flow conveyance capacity exceedence for the storm event that resulted in the maximum exceedence flow rates, based on the street flow design capacities identified in Table 3 – Street Flow Design Capacity for Design Storm Events.

The size of pipes required to convey the total exceedence flow rate were determined using the Hydraulic Elements analysis and assuming a one percent pipe grade.

The mitigation flow volume was determined based on the Small Area Unit Hydrograph Method (AES program) using the Orange County methods and datasets (see Appendix E for AES program calculations). The required mitigation volume was the difference between storm volume for the existing peak runoff rate and the storm volume for the required reduction in peak storm flow rate from the project site, without implementation of storm drain pipes to carry excess flow.

3.0 Results

The 25-year storm event exceedences were less than the 10-year storm event exceedences. Exceedences were higher for build out of the General Plan compared to existing conditions (primarily because of the existing vacant lands north of Center Avenue that could be developed with residential, commercial, and industrial land uses).

Tables 4 though 7 list the overall study area hydrologic characteristics for the 10- and 25-year design storm events. Figures 3 through 6 are the corresponding drainage maps that include street flow rates for all design storm events. There is no exceedence of City design standards for the 50-year and 100-year storm events; capacity constraints were limited to the 10-year and 25-year storm events.

Table 4: Existing Conditions Conveyance Capacity Exceedence: 10-year Storm Event

Study Area Model Node	Design Flow[a] (cfs)	Flow[b] (cfs)	Tc[b] (min)	Exceedence[c] (cfs)	Pipe size[e] (modeled diameter, ft / nominal size, inches)
Existing Conditions					
10	5.47	2.8	9.6	0	
20	5.47	4.9	11.9	0	
30	5.47	7.4	14.8	1.9	
40	5.47	11.7	18.9	6.2	1.2 / 16
Project site contribution to node 50		*5.7*	*14.2*	*4.4*	
50	5.47	23.4	23.3	17.9 (24.4%)[d]	1.8 / 22
55	5.70	24.9	26.5	19.2	1.9 / 24
60	7.57	30.4	19.3	22.8	2.0 / 24
70	5.53	39.7	24.5	34.2	2.4 / 30
Existing Conditions with Proposed Project					
10	5.47	2.8	9.6	0	
20	5.47	4.9	11.9	0	
30	5.47	7.4	14.8	1.9	
40	5.47	11.7	18.9	6.2	1.2 / 16
Project site contribution to node 50		*5.7*	*11.0*	*4.4*	
50	5.47	23.4	23.3	17.9 (24.4%)[d]	1.8 / 22
55	5.70	24.9	26.5	19.2	1.9 / 24
60	7.57	30.8	16.2	23.2	2.0 / 24
70	5.53	40.6	21.4	35.1	2.4/ 30

[a] Street Flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area, as described in Section 2.2.2. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway). Model output is provided in Appendix D.
[b] Peak flow contribution and Tc (time of concentration) are street flow model output values. See Appendix A for model output.
[c] Exceedence is the difference between modeled street flow and the design flow.
[d] Value in parenthesis is the proportion of total peak street flow contributed by the project site. This is representative of the project site contribution to the exceedance.
[e] Calculated pipe size to convey exceedence flows.
SOURCE: PBS&J 2008

Table 5: Existing Conditions Conveyance Capacity Exceedence: 25-year Storm Event

Study Area Model Node	Design Flow[a] (cfs)	Flow[b] (cfs)	Tc[b] (min)	Exceedence[c] (cfs)	Pipe size[e] (modeled diameter, ft / nominal size, inches)
Existing Conditions					
10	15.4	3.4	9.6	0	
20	15.4	6.0	11.8	0	
30	15.4	9.1	14.6	0	
40	15.4	14.6	18.4	0	
Project site contribution to node 50		*7.0*	*14.2*	*3.2*	
50	15.4	29.0	22.7	13.6 (24.1%)[d]	1.8 / 22
55	16.04	30.9	25.8	14.9	1.9 / 24
60	21.31	37.2	19.3	15.9	2.0 / 24
70	15.56	48.9	24.2	33.3	2.4 / 30
Existing Conditions with Proposed Project					
10	15.4	3.4	9.6	0	
20	15.4	6.0	11.8	0	
30	15.4	9.1	14.6	0	
40	15.4	14.6	18.4	0	
Project site contribution to node 50		*7.0*	*11.0*	*3.2*	
50	15.4	29.0	22.7	13.6 (24.1%)[d]	1.8 / 22
55	16.04	30.9	25.8	14.9	1.9 / 24
60	21.31	37.6	16.2	16.3	2.0 / 24
70	15.56	50.0	21.0	34.4	2.4 / 30

[a] Street Flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area, as described in Section 2.2.2. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway). Model output is provided in Appendix D.
[b] Peak flow contribution and Tc (time of concentration) are street flow model output values. See Appendix A for model output.
[c] Exceedence is the difference between modeled street flow and the design flow.
[d] Value in parenthesis is the proportion of total peak street flow contributed by the project site. This is representative of the project site contribution to the exceedance
[e] Use the same as for 10-year storm event; 25-year storm event exceedence is lower than 10-year event exceedence.
SOURCE: PBS&J 2008

Table 6: General Plan Build Out Conveyance Capacity Exceedence: 10-year Storm Event

Study Area Model Node	Design Flow[a] (cfs)	Flow[b] (cfs)	Tc[b] (min)	Exceedence[c] (cfs)	Pipe size[e] (modeled diameter, ft / nominal size, inches)
Existing Conditions					
10	5.47	4.1	5.6	0	
20	5.47	6.8	7.6	1.3	
30	5.47	9.8	10.4	4.3	1.1 / 14
40	5.47	13.7	14.2	8.2	1.4 / 18
Project site contribution to node 50		*6.5*	*14.2*	*5.19*	
50	5.47	27.2	18.5	21.7 (23.9%)[d]	2.0 / 24
55	5.47	28.5	21.7	22.8	2.0 / 24
60	7.57	34.0	23.6	26.4	2.1 / 26
70	5.53	42.8	24.4	37.3	2.4 / 30
Existing Conditions with Proposed Project					
10	5.47	4.1	5.6	0	
20	5.47	6.8	7.6	1.3	
30	5.47	9.8	10.4	4.3	1.1 / 14
40	5.47	13.7	14.2	8.2	1.4 / 18
Project site contribution to node 50		*6.5*	*11.0*	*5.19*	
50	5.47	27.2	18.5	21.7 (23.9%)[d]	2.0 / 24
55	5.47	28.5	21.7	22.8	2.0 / 24
60	7.57	34.0	23.6	26.4	2.1 / 26
70	5.53	43.3	21.3	37.8	2.4 / 30

[a] Street Flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area, as described in Section 2.2.2. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway). Model output is provided in Appendix D.
[b] Peak flow contribution and Tc (time of concentration) are street flow model output values. See Appendix A for model output.
[c] Exceedence is the difference between modeled street flow and the design flow.
[d] Value in parenthesis is the proportion of total peak street flow contributed by the project site. This is representative of the project site contribution to the exceedance.
[e] Use the same as for 10-year storm event; 25-year storm event exceedence is lower than 10-year event exceedence.
SOURCE: PBS&J 2008

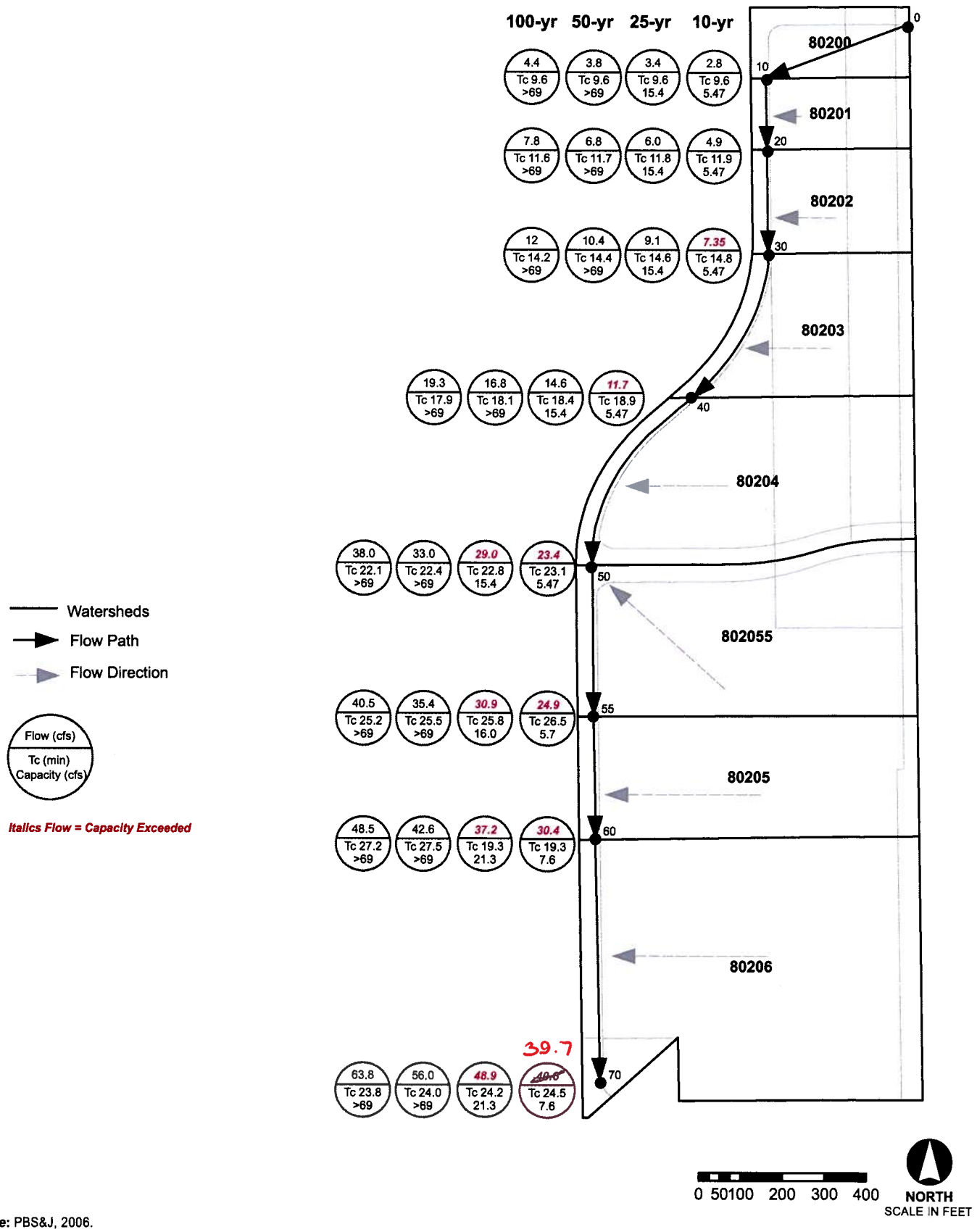
Table 7: General Plan Build Out Conveyance Capacity Exceedence: 25-year Storm Event

Study Area Model Node	Design Flow[a] (cfs)	Flow[b] (cfs)	Tc[b] (min)	Exceedence[c] (cfs)	Pipe size[e] (modeled diameter, ft / nominal size, inches)
Existing Conditions					
10	15.4	4.9	5.6	0	
20	15.4	8.2	7.5	0	
30	15.4	11.9	10.1	0	
40	15.4	16.9	13.8	1.5	1.4 / 18
Project site contribution to node 50		*7.9*	*14.2*	*4.2*	
50	15.4	33.3	18	17.9 (23.7%)[d]	2.0 / 24
55	16.04	35.0	21.2	19.0	2.0 / 24
60	21.31	41.7	23.2	20.4	2.1 / 26
70	15.56	52.6	24	37.0	2.4 / 30
Existing Conditions with Proposed Project					
10	15.4	4.9	5.6	0	
20	15.4	8.2	7.5	0	
30	15.4	11.9	10.1	0	
40	15.4	16.9	13.8	2	1.4 / 18
Project site contribution to node 50		*7.9*	*11.0*	*4.2*	
50	15.4	33.3	18	17.9 (23.7%)[d]	2.0 / 24
55	16.04	35.0	21.2	19.0	2.0 / 24
60	21.31	41.7	23.2	20.4	2.1 / 26
70	15.56	53.1	20.9	37.5	2.4 / 30

[a] Street Flow design flow is based on best available information for Gothard Street configurations within the study area and does not include as-built slope information for the majority of the study area, as described in Section 2.2.2. A typical secondary arterial highway cross-section was used to describe Gothard Street (80-foot width, including parkway). Model output is provided in Appendix D.
[b] Peak flow contribution and Tc (time of concentration) are street flow model output values. See Appendix A for model output.
[c] Exceedence is the difference between modeled street flow and the design flow.
[d] Value in parenthesis is the proportion of total peak street flow contributed by the project site. This is representative of the project site contribution to the exceedance.
[e] Use the same as for 10-year storm event; 25-year storm event exceedence is lower than 10-year event exceedence.
SOURCE: PBS&J 2008

Even though the proposed project would have a higher peak project site runoff rate and flow path slope compared to the existing project site (one percent compared to about two percent), the increased travel length and timing of peak flows results in no modeled increase to the contribution of street flow exceedence than the existing project site and would have no effect on the downstream drainage peak street flow rates. Consequently, the same detention to mitigate the existing project site runoff would be required for the proposed project. The project site contributes about 24 percent[3] of the exceedence flows to Gothard Street upon General Plan Build-out.

[3] See Table 6. The project site contribution to peak street flow rate for the 10-year storm event is about 6.5 cfs of the total street flow peak flow of 27.2 cfs. This is about 24 percent of the peak street flow. The percentage decreases as additional catchments add more runoff.



Source: PBS&J, 2006.

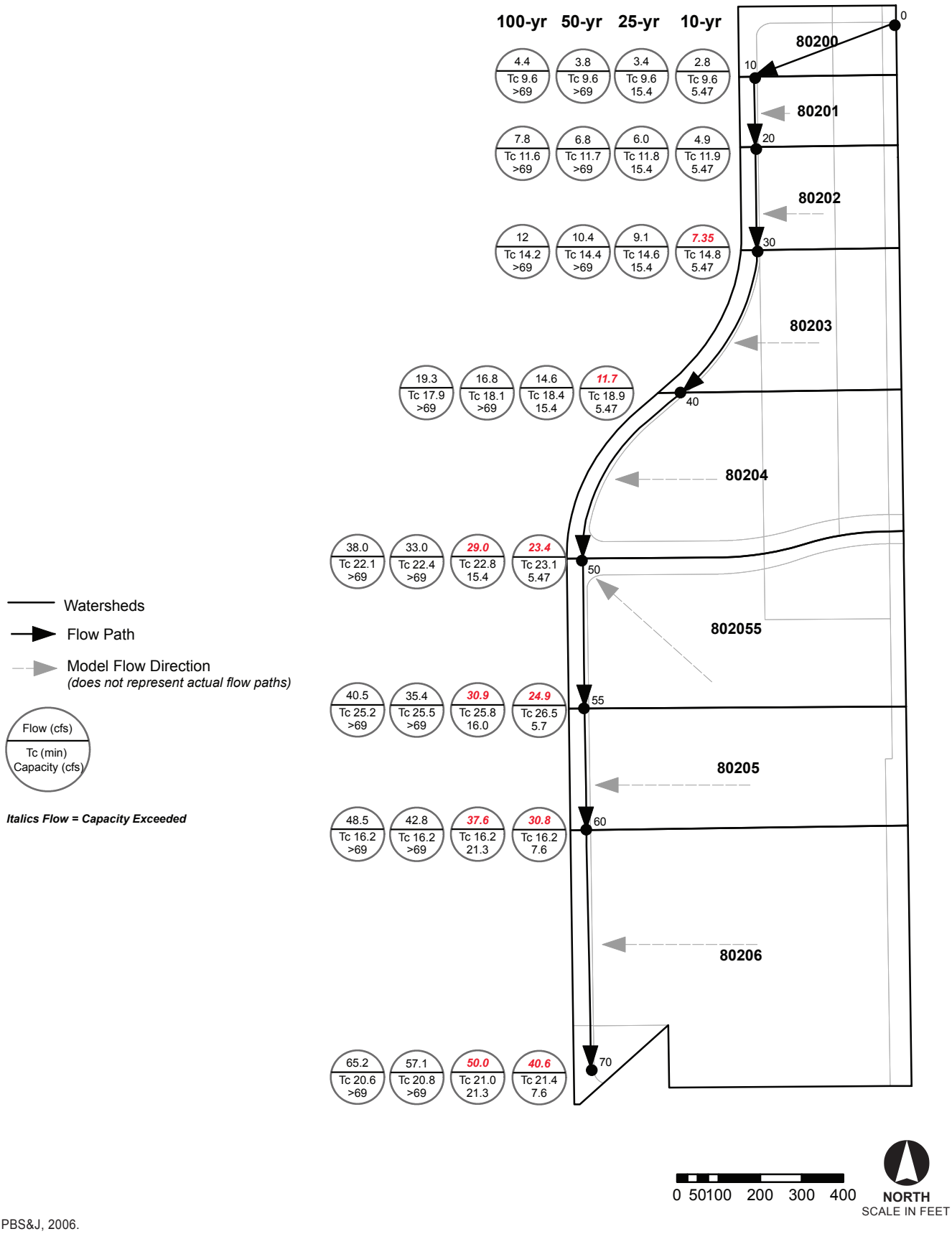
FIGURE 3

Study Area Existing Conditions Drainage Map

0D2138700

The Ripcurl

03002 | JCS | 08



Source: PBS&J, 2006.

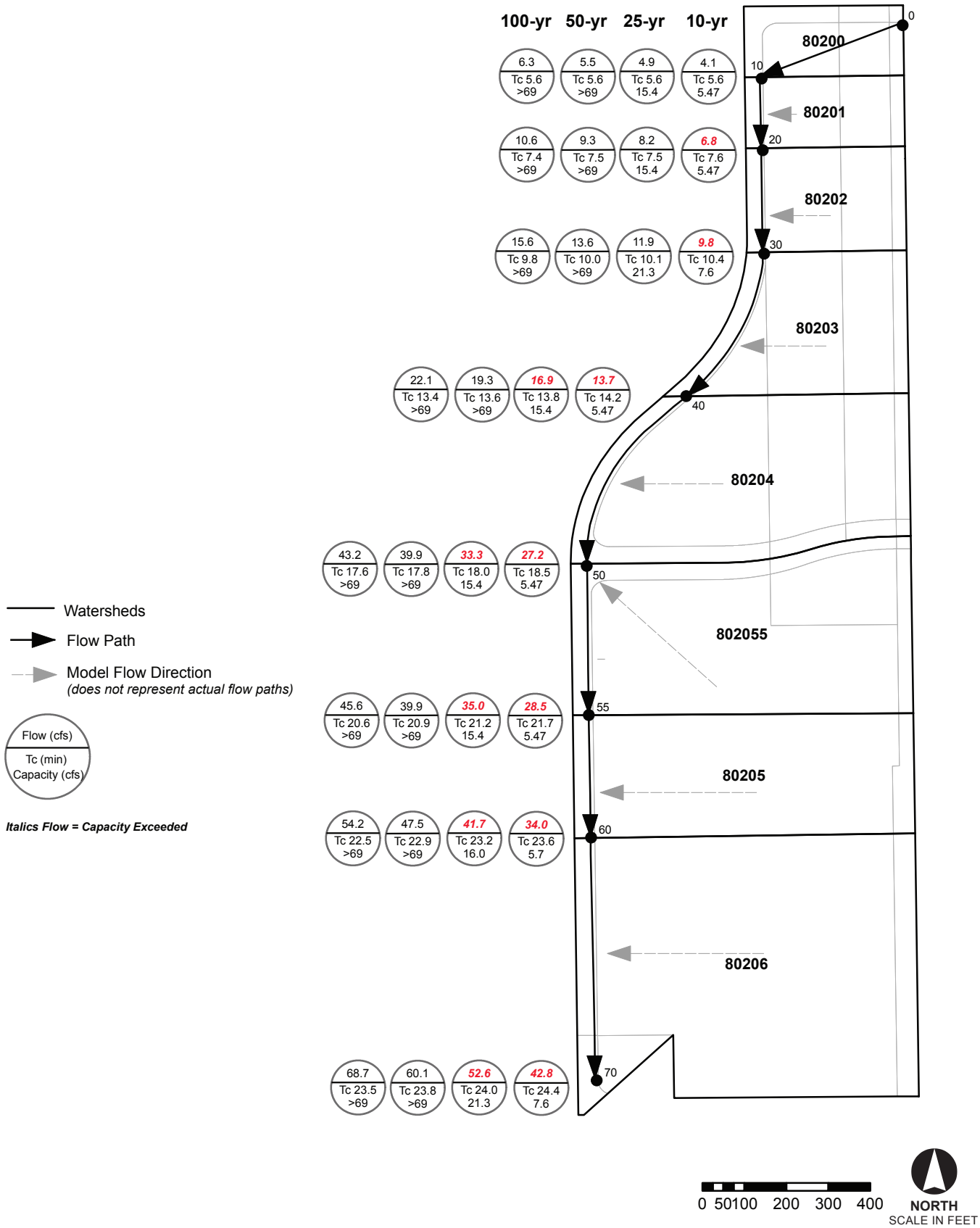
FIGURE **4**

Study Area Existing Conditions with Proposed Project Drainage Map

0D2138700

The Ripcurl

03002 | JCS | 08



Source: PBS&J, 2006.

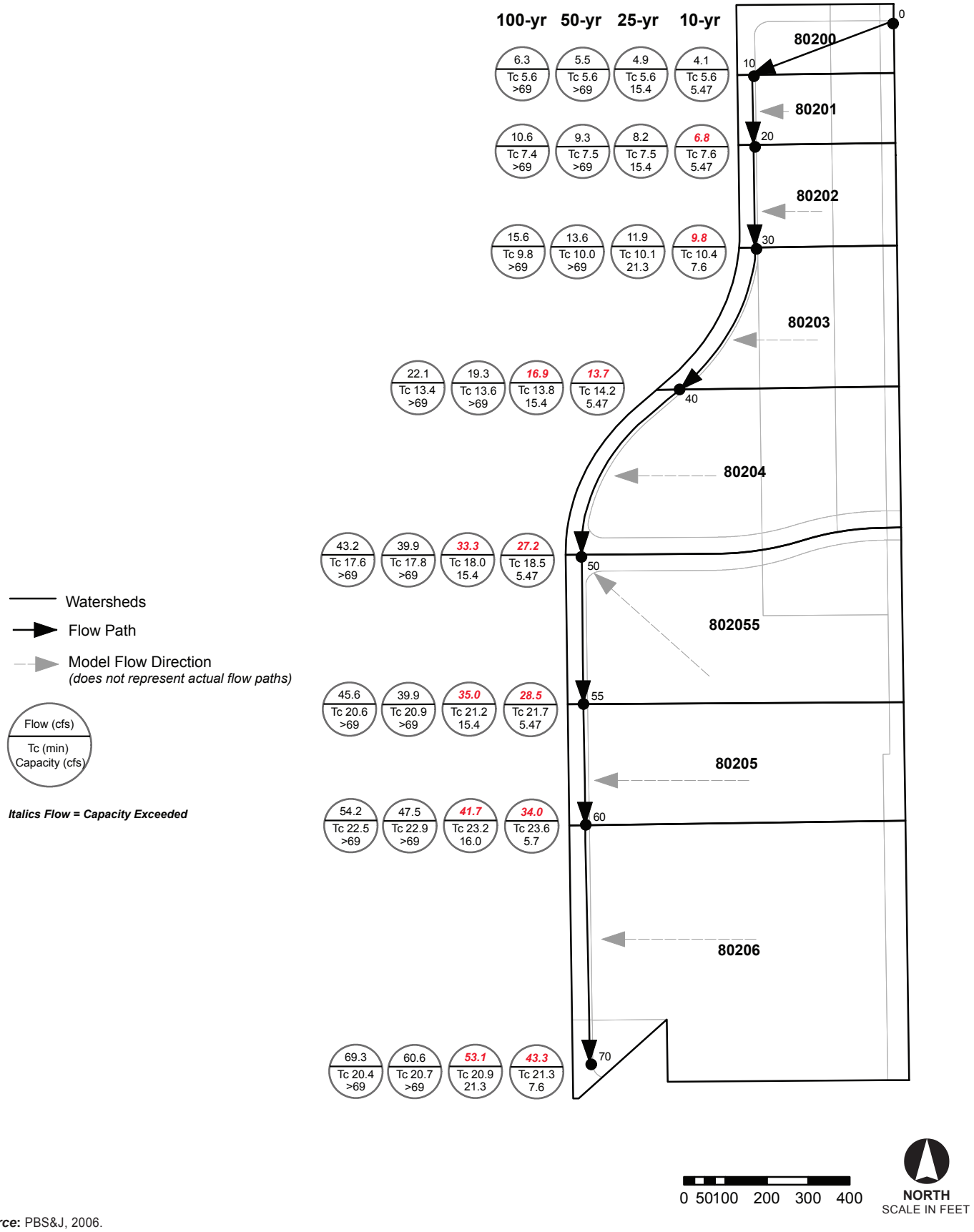
FIGURE **5**

Study Area Build-Out Conditions Drainage Map

0D2138700

The Ripcurl

03002 | JCS | 08



Source: PBS&J, 2006.

FIGURE **6**

Study Area Build-Out Conditions Drainage Map with Proposed Project

0D2138700

The Ripcurl

03002 | JCS | 08

4.0 Regional Context

The site is located within the Westminster Watershed and drainage from the site street flows south along Gothard Street to the intersection of Edinger Avenue and Gothard Street. There, it enters the storm drain system that flows south in the Murdy Channel. A pump station at Heil Avenue lifts water in the Murdy Channel, and flow in Murdy Channel discharges to the East Garden Grove-Wintersburg Channel (C05) to the south. The East Garden Grove-Wintersburg Channel runs primarily east to west within the project vicinity and discharges to Bolsa Bay, Huntington Harbour, and eventually, the Pacific Ocean (see Figure F.1 in Appendix F).

The MPD requires implementation of a new storm drain to meet flood control design requirements for street flow along Gothard Street from Center Avenue to Edinger Avenue (see Figure F.1 in Appendix F). The MPD also requires additional capacity for the improved section of the storm drain along Edinger Avenue of 52 cfs at Gothard Street to 127 cfs where the storm drain turns south from Edinger Avenue. Where the storm drain system turns south from Edinger Avenue to connect to the Murdy Channel, no improvements have been identified. Additionally, no improvements are identified for the Murdy Channel through the East Garden Grove-Wintersburg Channel to the Pacific Ocean. Therefore, there are no expected capacity constraints for the storm drain system from south of Edinger Avenue to the Pacific Ocean.

5.0 Mitigation

Overall, the study area exceeds the street flow capacity design criteria for the 10-year and 25-year storm event. The larger exceedence occurs for the 10-year storm event, because the difference in the amount of stormwater runoff and allowable street flow rate is higher than for the 25-year storm event (see Tables 4 through 7). Based on a Final Design Hydrology Report, mitigation will target facility sizing based on the highest storm event exceedences. Mitigation can be either through implementation of storm drain improvements (piped flow for excess Gothard Street peak flow rates) or on-site detention. Final detention volumes will be determined based on a Final Design Hydrology Study that will include full build-out impacts for the highest storm event exceedence. On-site detention would immediately mitigate project site impacts on street flow exceedences, but every catchment would be required to retain each site's contribution to peak flow to completely mitigate the existing exceedances in street flow. Mitigation via piped flow would require implementation of the entire downstream MPD proposed improvements before street flow exceedences would be completely mitigated.

5.1.1 Detention Practices

Potential mitigation through on-site detention and/or retention could be provided by using flow-through planter boxes, green roofs, underground storage in pipes or vaults, or other technologies.

The existing project site flow volume for the 10-year storm event is 1.04 acre-feet (see Appendix E). Reducing project site runoff by 4.4 cfs would result in a total project site runoff volume of 0.52 acre-feet. Therefore, the project site would have to detain 0.52 acre-feet to reduce the project site's peak flow rate contribution to street flow exceedence if the whole hydrograph is treated. For build-out of the General Plan, the project site contribution to street flow exceedence would be higher and require 0.61 acre-feet of detention.

Table 8: 10-year Storm Event Site Contributions

Value	Existing Conditions + Project	General Plan Build-out + Project
Site Peak Run-off [a]	7.6 cfs	7.6 cfs
Street Capacity [b]	5.47 cfs	5.47 cfs
Street Flow at node 50 [b]	23.4 cfs	27.2 cfs
Site Contribution to Peak Flow [b]	5.7 cfs	6.5 cfs
Exceedance [c]	17.9 cfs	21.7 cfs
Percent Project Contribution to Total Flow [d]	24.4 %	23.9 %
Project Contribution to Exceedance [e]	4.4 cfs	5.2 cfs
Total site runoff [f]	1.04 acre-feet	1.04 acre-feet
Required Mitigated Volume – Hydrograph Modification[g]	0.52 acre-feet	0.61 acre-feet
Required Mitigated Volume – Peak Shaving[h]	0.067 acre-feet	0.079 acre-feet

a. Site contribution calculations in Appendix A and B, General Plan Build-out Summary page 1.
b. See Table 4 for Existing Conditions and Table 6 for General Plan Build-out
c. Difference of street flow at node 50 and street capacity
d. Project contribution divided by total flow
e. Percent project contribution times exceedance
f. Unmitigated run-off volume. See Appendix E for hydrographs for existing conditions
g. Difference of unmitigated run-off hydrograph volume (1.04 acre-feet) and the hydrograph with the reduce runoff rate to prevent exceedance of street flow.
h. Amount of detention volume required if all flows lower than the acceptable peak flow rate pass through, but flows above that are attenuated (the "peak" of the hydrogaph is shaved off to an acceptable peak flow rate).

SOURCE: PBS&J 2008

Green roofs would contribute to both stormwater retention and detention, as well as provide aesthetic functions. Green roofs can detain 60 to 100 percent of precipitation, depending upon the substrate.[4] If implemented, the project developer should consult with a landscape architect to determine appropriate plantings and maintenance. If a green roof is planned for the proposed project, roof tops must be structurally designed to support the green roof system. Additionally, management and maintenance must be incorporated in the project WQMP to minimize nuisance discharges of pollutants.

Because of site constraints, there is little available room for stormwater detention features unless they are installed underground. Additionally, the depth to shallow groundwater can be expected to be within five feet of the ground surface, precluding infiltration-type stormwater retention and complicating use of underground structures for detention. Underground structures (e.g., underground detention in pipes or vaults) could, however, be used provided they are dry-flood proofed. Underground detention structures would likely require pumps to discharge to the street or street storm pipe system (if implemented), depending upon the design elevations of the street storm pipe system. Discharges of all detained flows shall be treated per the approved Final Water Quality Management Plan prior to outflow to the storm drain system.

5.1.2 Piped Flow

Based on the pipe sizes required to convey the street flow exceedences along Gothard Avenue, a 2-foot minimum diameter pipe with a one percent slope would be required adjacent to the project site (node 50, MPD node 80205) transitioning to a 2.5-foot diameter pipe at node 60 (MPD node 80206). These pipes would be sufficient to convey all excess flow from Gothard Street for the 10-year and 25-year storm

[4] N.D. VanWoert, D. B. Rowe,J. A. Andresen, C. L. Rugh, R. T. Fernandez, and L. Xiao. 2005. Green Roof Stormwater Retention: Effects of Roof Surface, Slope, and Media Depth. J. Environ. Qual. 34:1036–1044. Available at: http://jeq.scijournals.org/cgi/reprint/34/3/1036.pdf

events. The project site contribution to peak flow in Gothard Street adjacent to the project site is about 24 percent. However, final pipe sizes shall be determined based upon the Final Design Hydrology Report and full build-out flows.

6.0 Conclusions

Gothard Street street flow capacity exceedence occurs for the 10-year and 25-year storm events, with the 10-year storm event having the highest exceedence rates. This Preliminary Hydrology Study modeled higher street flow exceedence rates than identified in the City MPD; adjacent to the project site street flow design capacity was exceeded by 18 to 19 cfs compared to the MPD assessment of 8 cfs. However, the pipe size required to mitigated this exceedence is not substantially greater than that proposed in the MPD. The MPD estimated the average street capacity (according to the specified street drainage rules) for the 10-year event to be about 20 cfs, whereas for the 100-year the capacity is estimated to be about 300 cfs. While the 100-year street flow capacity is likely sufficient, this Preliminary Hydrology Study determined a much lower 10-year street flow capacity along Gothard Street: street flow capacity was estimated at no more than 7.6 cfs, based on review of the as-builts for Gothard and 1 m DEM.

Additionally, street flow capacity determinations are highly dependant upon the final surveyed cross-sections and street slope. No as-built plans were available for most of Gothard Street, therefore, actual street slopes could be higher or flatter than modeled, resulting in less or more capacity exceedence, respectively. Regardless, the values used are a suitable preliminary representation of the overall street slope within the study area; DEM determined slopes are similar to slopes measured adjacent to the project site (0.17 percent) and at the Gothard Street/Edinger Avenue intersection (0.13 percent).

Re-development of the project site in accordance with the Preliminary Grading Plan does not contribute to more street flow capacity exceedence. However, because the existing system is already exceeded, stormwater runoff from the project site will contribute to exceedence of the street storm flow design standards. Implementation of on-site detention, to the maximum extent practicable, would reduce the immediate effect of capacity constraints in the existing system. Implementation of piped storm flow in accordance with Tables 4 and 5, along with the further downstream improvements identified in the MPD would reduce long-term system capacity constraints. Final mitigation requirements shall be determined based upon the Final Design Hydrology Report for the proposed project.

7.0 References

City of Huntington Beach. Master Plan of Drainage. Citywide Urban Runoff Management Plan Section 4: Drainage Element. January 2005.

Orange County Environmental Management Agency. Orange County Hydrology Manual. October 1986.

Orange County Environmental Management Agency. Orange County Local Drainage Manual. January 1996.

Engineering Hydrologic Software Solutions. Advanced Engineering Softwater (AES) RATSCx 2007 v. 13.0 for Orange County. (approved for use in Orange County; based on the Orange County Hydrology Manual, 1986).

Fuscoe Engineering. Preliminary Grading Plan. Dated June 4, 2008. Prepared for AMSTAR / Red Oak Huntington Beach, LLC.

Williamson and Schmid, Civil Engineers, Irvine, California. Orange County Hydrology Workbook. September 1987.

Appendix A	**Existing Conditions Model**
Appendix B	**General Plan Build-Out Model**
Appendix C	**Study Area Characteristic**
Appendix D	**Street Flow Model**
Appendix E	**Hydrographs**
Appendix F	**Regional Drainage Map**
Appendix G	**Gothard Street As-Builts**

Appendix A

Existing Conditions Model

Example Model Schematic A:

```
+#     0.00 ( 114.94)+
|  INITIAL  SUBAREA  |
|  LENGTH =  313. FT |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    1.22 AC |
+#    10.00 ( 100.00)+
          |
          V
+#    10.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  168.7 FT |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    1.22 AC |
+#    20.00 (  99.73)+
          |
          V
+#    20.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  247.1 FT |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    1.79 AC |
+#    30.00 (  99.61)+
          |
          V
+#    30.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  382.7 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    0.74 AC |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    2.81 AC |
+#    40.00 (  99.40)+
          |
          V
+#    40.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  460.3 FT |
|....................|
|     COMMERCIAL     |  +#    52.00 ( 107.95)+
|  SOIL GROUP  C     |  |  INITIAL  SUBAREA  |
|  AREA =    3.06 AC |  |  LENGTH =  795. FT |
|....................|  |....................|
|       GRASS        |  |     COMMERCIAL     |
|  SOIL GROUP  C     |  |  SOIL GROUP  C     |
|  AREA =    2.29 AC |  |  AREA =    3.82 AC |
+#    50.00 (  99.27)+  +#    50.00 ( 100.00)+
          |                     |
          V                     V
+----#     50.00 ----+  +----#     50.00 ----+
|     CONFLUENCE     |  |     CONFLUENCE     |
|      ANALYSIS      |<=|      ANALYSIS      |
|....................|  |....................|
|     STREAM #  1    |  |     STREAM #  2    |
+----#     50.00 ----+  +----#     50.00 ----+
==============================================>   CONFLUENCE    OF       2    STREAMS
<==============================================
```

```
          |
          V
+#    50.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  358.7 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    0.67 AC |
|....................|
|   USER-SPECIFIED   |
|  Fp =   0.25 IN/HR |
|  Ap = 0.75         |
|  AREA =    1.94 AC |
+#    55.00 (  99.39)+
          |
          V
+#    55.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  292.6 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    4.24 AC |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    0.52 AC |
+#    60.00 (  99.12)+
          |
          V
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

Existing Conditions:  10-year

 ----------------------------------------------------------------------------
   FILE NAME: E10.DAT
   TIME/DATE OF STUDY: 22:26 06/07/2008
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
   *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.793
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                    C        1.22      0.25     1.000    86    9.60
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
   SUBAREA RUNOFF(CFS) =      2.78
   TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.78
```



```
****************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.01
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.43
     HALFSTREET FLOOD WIDTH(FEET) =   17.66
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.24
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
   STREET FLOW TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   11.86
   *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.474
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                    C        1.22      0.25     1.000    86
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    2.45
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       4.88

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  19.09
   FLOW VELOCITY(FEET/SEC.) =  1.30   DEPTH*VELOCITY(FT*FT/SEC.) =   0.59
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300
```

```
  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.44
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.50
  HALFSTREET FLOOD WIDTH(FEET) =   21.22
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.40
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
STREET FLOW TRAVEL TIME(MIN.) =   2.95   Tc(MIN.) =   14.81
*  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.179
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
NATURAL POOR COVER
"GRASS"                    C        1.79      0.25     1.000    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    3.11
EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =       7.35

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.52   HALFSTREET FLOOD WIDTH(FEET) =  22.34
FLOW VELOCITY(FEET/SEC.) =  1.44   DEPTH*VELOCITY(FT*FT/SEC.) =   0.75
LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
REPRESENTATIVE SLOPE =  0.0016
STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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 =   0.0300

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.06
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.58
  HALFSTREET FLOOD WIDTH(FEET) =   25.16
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.56
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
STREET FLOW TRAVEL TIME(MIN.) =   4.08   Tc(MIN.) =   18.89
*  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.895
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                 C        0.74      0.25     0.100    69
NATURAL POOR COVER
"GRASS"                    C        2.81      0.25     1.000    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    5.42
EFFECTIVE AREA(ACRES) =      7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
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TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      11.68

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.61   HALFSTREET FLOOD WIDTH(FEET) =  26.66
FLOW VELOCITY(FEET/SEC.) =  1.62   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
REPRESENTATIVE SLOPE =  0.0016
STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 32.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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 =   0.0300

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.44
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.67
  HALFSTREET FLOOD WIDTH(FEET) =   29.69
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.73
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
STREET FLOW TRAVEL TIME(MIN.) =   4.42   Tc(MIN.) =   23.31
*  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.680
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                 C        3.06      0.25     0.100    69
NATURAL POOR COVER
"GRASS"                    C        2.29      0.25     1.000    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =    7.50
EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      17.68

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.70   HALFSTREET FLOOD WIDTH(FEET) =  32.82
FLOW VELOCITY(FEET/SEC.) =  1.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.25
LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   23.31
RAINFALL INTENSITY(INCH/HR) =   1.68
AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.25
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  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.68

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.236
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25      0.100    69   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.60
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =      7.60

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   2.24
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       17.68   23.31    1.680  0.25( 0.18) 0.74      13.1       0.00
      2        7.60   14.16    2.236  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       22.33   14.16    2.236  0.25( 0.13) 0.53      11.8      52.00
      2       23.37   23.31    1.680  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.37    Tc(MIN.) =    23.31
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       17.0
```



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  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.03
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.47   SPLIT FLOOD WIDTH(FEET) =   19.59
    SPLIT FLOW(CFS) =    5.42   SPLIT VELOCITY(FEET/SEC.) =    1.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   26.48
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.562
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25      0.100    69
  USER-DEFINED               -        1.94      0.25      0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    3.33
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      24.88

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.99
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.31   SPLIT FLOOD WIDTH(FEET) =   11.65
    SPLIT FLOW(CFS) =    1.94   SPLIT VELOCITY(FEET/SEC.) =    1.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   28.43
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.500
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    6.21
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      30.00

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       30.35   19.28    1.874  0.25( 0.11) 0.46      19.2      52.00
      2       30.00   28.43    1.500  0.25( 0.13) 0.52      24.3       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      30.35  Tc(MIN.) =   19.28
  AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.46  EFFECTIVE AREA(ACRES) =      19.17
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      37.11
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.83
    SPLIT DEPTH(FEET) =    0.70   SPLIT FLOOD WIDTH(FEET) =   33.19
    SPLIT FLOW(CFS) =   18.09   SPLIT VELOCITY(FEET/SEC.) =    1.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.31
  STREET FLOW TRAVEL TIME(MIN.) =   5.22   Tc(MIN.) =   24.50
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.633
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   13.53
  EFFECTIVE AREA(ACRES) =     28.60    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      39.73

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.78
  FLOW VELOCITY(FEET/SEC.) =  1.86   DEPTH*VELOCITY(FT*FT/SEC.) =   1.34
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   18.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     24.50
  EFFECTIVE AREA(ACRES) =     28.60  AREA-AVERAGED Fm(INCH/HR)=  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.358
  PEAK FLOW RATE(CFS)   =      39.73

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       39.73   24.50    1.633  0.25( 0.09) 0.36      28.6      52.00
      2       38.20   33.65    1.361  0.25( 0.10) 0.42      33.8       0.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS


____________________________________________________________________________
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                         Analysis prepared by:
                       Sabrina Cook, Ph.D  PBS&J
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Existing Conditions:  25-year

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   FILE NAME: E25.DAT
   TIME/DATE OF STUDY: 22:28 06/07/2008
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   25.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.334
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                     C        1.22      0.25     1.000    86    9.60
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
   SUBAREA RUNOFF(CFS) =       3.37
   TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      3.37

 ****************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00
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   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.87
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.45
     HALFSTREET FLOOD WIDTH(FEET) =   19.03
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.31
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.59
   STREET FLOW TRAVEL TIME(MIN.) =   2.15   Tc(MIN.) =   11.75
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.974
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                     C        1.22      0.25     1.000    86
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.00
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       5.98

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.49   HALFSTREET FLOOD WIDTH(FEET) =  20.59
   FLOW VELOCITY(FEET/SEC.) =  1.38   DEPTH*VELOCITY(FT*FT/SEC.) =   0.67
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

 ****************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.90
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.53
     HALFSTREET FLOOD WIDTH(FEET) =   22.97
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.47
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
   STREET FLOW TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =   14.56
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.635
   SUBAREA LOSS RATE DATA(AMC  II):
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  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "GRASS"                     C        1.79      0.25      1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    3.85
 EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =       9.08

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.56   HALFSTREET FLOOD WIDTH(FEET) =  24.22
 FLOW VELOCITY(FEET/SEC.) =  1.52   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 REPRESENTATIVE SLOPE =  0.0016
 STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
 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 =   0.0300

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.45
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.62
   HALFSTREET FLOOD WIDTH(FEET) =   27.34
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.64
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.02
 STREET FLOW TRAVEL TIME(MIN.) =   3.88   Tc(MIN.) =   18.44
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.305
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  C        0.74      0.25      0.100    69
 NATURAL POOR COVER
 "GRASS"                     C        2.81      0.25      1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
 SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    6.73
 EFFECTIVE AREA(ACRES) =      7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
 TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      14.55

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.65   HALFSTREET FLOOD WIDTH(FEET) =  28.97
 FLOW VELOCITY(FEET/SEC.) =  1.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
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----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 REPRESENTATIVE SLOPE =  0.0016
 STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
 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 =   0.0300

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      19.19
   ***STREET FLOW SPLITS OVER STREET-CROWN***
   FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
   FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
   SPLIT DEPTH(FEET) =    0.19   SPLIT FLOOD WIDTH(FEET) =    5.64
   SPLIT FLOW(CFS) =    0.29   SPLIT VELOCITY(FEET/SEC.) =    0.69
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.71
   HALFSTREET FLOOD WIDTH(FEET) =   34.38
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
 STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   22.66
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.051
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  C        3.06      0.25      0.100    69
 NATURAL POOR COVER
 "GRASS"                     C        2.29      0.25      1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
 SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =    9.28
 EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
 TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      22.06

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
 FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   22.66
 RAINFALL INTENSITY(INCH/HR) =   2.05
 AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.74
 EFFECTIVE STREAM AREA(ACRES) =      13.14
 TOTAL STREAM AREA(ACRES) =      13.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      22.06
```

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****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.676
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  C        3.82      0.25     0.100    69   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.12
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =      9.12

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   2.68
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.12

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       22.06   22.66    2.051  0.25( 0.18) 0.74      13.1       0.00
      2        9.12   14.16    2.676  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       27.52   14.16    2.676  0.25( 0.13) 0.54      12.0      52.00
      2       29.02   22.66    2.051  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.02    Tc(MIN.) =    22.66
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
```



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----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      31.09
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.60   SPLIT FLOOD WIDTH(FEET) =   26.09
    SPLIT FLOW(CFS) =   11.48   SPLIT VELOCITY(FEET/SEC.) =    1.66
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   25.83
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.904
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.67      0.25     0.100    69
  USER-DEFINED                -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    4.13
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      30.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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
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  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.72
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.49   SPLIT FLOOD WIDTH(FEET) =   21.03
    SPLIT FLOW(CFS) =    8.68   SPLIT VELOCITY(FEET/SEC.) =    1.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   27.78
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.827
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    7.62
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      37.18

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)    NODE
      1       37.22   19.28    2.247  0.25( 0.11) 0.46      19.4      52.00
      2       37.18   27.78    1.827  0.25( 0.13) 0.52      24.3       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      37.22  Tc(MIN.) =   19.28
  AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.46  EFFECTIVE AREA(ACRES) =      19.40
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300
```



```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      45.45
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.75
    HALFSTREET FLOOD WIDTH(FEET) =   36.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.46
  STREET FLOW TRAVEL TIME(MIN.) =   4.91   Tc(MIN.) =   24.18
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.977
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   16.44
  EFFECTIVE AREA(ACRES) =     28.83    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      48.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.77   HALFSTREET FLOOD WIDTH(FEET) =  36.97
  FLOW VELOCITY(FEET/SEC.) =  2.00   DEPTH*VELOCITY(FT*FT/SEC.) =   1.53
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   22.6 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     24.18
  EFFECTIVE AREA(ACRES) =     28.83  AREA-AVERAGED Fm(INCH/HR)=  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.361
  PEAK FLOW RATE(CFS)   =      48.94

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)    NODE
      1       48.94   24.18    1.977  0.25( 0.09) 0.36      28.8      52.00
      2       47.42   32.74    1.665  0.25( 0.10) 0.42      33.8       0.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS


 ____________________________________________________________________________
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                              Analysis prepared by:
                            Sabrina Cook, Ph.D  PBS&J

Existing Conditions:  50-year

 ---------------------------------------------------------------------------
  FILE NAME: E50.DAT
  TIME/DATE OF STUDY: 22:29 06/07/2008
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
```

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

  USER SPECIFIED STORM EVENT(YEAR) =   50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.758
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25     1.000    86    9.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.84
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      3.84

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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
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  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.55
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.47
    HALFSTREET FLOOD WIDTH(FEET) =   20.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.35
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.64
  STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =   11.69
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.363
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.43
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       6.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.51   HALFSTREET FLOOD WIDTH(FEET) =  21.72
  FLOW VELOCITY(FEET/SEC.) =  1.42   DEPTH*VELOCITY(FT*FT/SEC.) =   0.72
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.56
    HALFSTREET FLOOD WIDTH(FEET) =   24.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.52
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   2.71   Tc(MIN.) =   14.39
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.989
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.79      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    4.42
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
```

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  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      10.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.58   HALFSTREET FLOOD WIDTH(FEET) =  25.53
  FLOW VELOCITY(FEET/SEC.) =  1.57   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.65
    HALFSTREET FLOOD WIDTH(FEET) =   28.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.71
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.11
  STREET FLOW TRAVEL TIME(MIN.) =   3.74   Tc(MIN.) =   18.13
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.623
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.74      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.81      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
  SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    7.74
  EFFECTIVE AREA(ACRES) =       7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      16.78

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.69   HALFSTREET FLOOD WIDTH(FEET) =  31.57
  FLOW VELOCITY(FEET/SEC.) =  1.77   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00
```



```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.09
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.40   SPLIT FLOOD WIDTH(FEET) =   16.16
    SPLIT FLOW(CFS) =    3.19   SPLIT VELOCITY(FEET/SEC.) =    1.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   22.35
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.330
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.06      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.29      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   10.63
  EFFECTIVE AREA(ACRES) =      13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      25.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   22.35
  RAINFALL INTENSITY(INCH/HR) =   2.33
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      25.35

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.017
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       3.82      0.25     0.100    69   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.29
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     10.29

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   3.02
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.29

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.35   22.35    3.330  0.25( 0.18) 0.74      13.1       0.00
      2       10.29   14.16    3.017  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       31.49   14.16    3.017  0.25( 0.13) 0.54      12.1      52.00
      2       33.28   22.35    3.330  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.28    Tc(MIN.) =    22.35
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =      17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00
```



```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.64
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.67   SPLIT FLOOD WIDTH(FEET) =   29.69
    SPLIT FLOW(CFS) =   16.03   SPLIT VELOCITY(FEET/SEC.) =    1.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   25.53
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.161
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    69
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    4.73
  EFFECTIVE AREA(ACRES) =      19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      35.44

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      39.77
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.58   SPLIT FLOOD WIDTH(FEET) =   25.09
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   SPLIT FLOW(CFS) =   13.72   SPLIT VELOCITY(FEET/SEC.) =    2.14
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.71
   HALFSTREET FLOOD WIDTH(FEET) =   34.38
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
 STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   27.47
 *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.073
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        4.24      0.25     0.100    69
 NATURAL POOR COVER
 "GRASS"                    C        0.52      0.25     1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
 SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    8.67
 EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
 TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      42.55

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
 FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 REPRESENTATIVE SLOPE =  0.0016
 STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 32.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
 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 =   0.0300

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      50.43
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.77
   HALFSTREET FLOOD WIDTH(FEET) =   37.34
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.01
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.56
 STREET FLOW TRAVEL TIME(MIN.) =   4.74   Tc(MIN.) =   32.22
 *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  1.894
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        8.82      0.25     0.100    69
 NATURAL POOR COVER
 "GRASS"                    C        0.62      0.25     1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
 SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   15.74
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 EFFECTIVE AREA(ACRES) =     33.76    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
 TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      54.38

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.79   HALFSTREET FLOOD WIDTH(FEET) =  38.19
 FLOW VELOCITY(FEET/SEC.) =  2.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.63
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
        AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   25.5 CFS,
        WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       55.95   23.98    2.239  0.25( 0.09) 0.36      28.9      52.00
     2       54.38   32.22    1.894  0.25( 0.10) 0.42      33.8       0.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =      55.95  Tc(MIN.) =   23.98
 AREA-AVERAGED Fm(INCH/HR) =  0.09  AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.36  EFFECTIVE AREA(ACRES) =      28.94
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     23.98
 EFFECTIVE AREA(ACRES) =     28.94  AREA-AVERAGED Fm(INCH/HR)=  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.363
 PEAK FLOW RATE(CFS)   =      55.95

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       55.95   23.98    2.239  0.25( 0.09) 0.36      28.9      52.00
     2       54.38   32.22    1.894  0.25( 0.10) 0.42      33.8       0.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS


____________________________________________________________________________
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2007 Advanced Engineering Software (aes)
            Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

Existing Conditions:  100-year


----------------------------------------------------------------------------
 FILE NAME: E100.DAT
 TIME/DATE OF STUDY: 22:29 06/07/2008
============================================================================
 USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

 USER SPECIFIED STORM EVENT(YEAR) =  100.00
 SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
 *DATA BANK RAINFALL USED*
```

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  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.257
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                     C        1.22      0.25     1.000    97    9.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =       4.38
  TOTAL AREA(ACRES) =       1.22   PEAK FLOW RATE(CFS) =      4.38

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.35
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.50
    HALFSTREET FLOOD WIDTH(FEET) =   21.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.39
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    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   2.02   Tc(MIN.) =   11.62
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.816
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        1.22      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.93
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       7.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  22.84
  FLOW VELOCITY(FEET/SEC.) =  1.47   DEPTH*VELOCITY(FT*FT/SEC.) =   0.78
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.58
    HALFSTREET FLOOD WIDTH(FEET) =   25.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.57
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.92
  STREET FLOW TRAVEL TIME(MIN.) =   2.62   Tc(MIN.) =   14.24
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.397
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        1.79      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    5.08
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      11.99

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.61   HALFSTREET FLOOD WIDTH(FEET) =  26.91
  FLOW VELOCITY(FEET/SEC.) =  1.63   DEPTH*VELOCITY(FT*FT/SEC.) =   1.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.
```

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****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.68
    HALFSTREET FLOOD WIDTH(FEET) =   31.07
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.20
  STREET FLOW TRAVEL TIME(MIN.) =   3.62   Tc(MIN.) =   17.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.984
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.74      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        2.81      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
  SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    8.90
  EFFECTIVE AREA(ACRES) =      7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      19.31

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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
```



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  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.38
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.50   SPLIT FLOOD WIDTH(FEET) =   21.28
    SPLIT FLOW(CFS) =    6.47   SPLIT VELOCITY(FEET/SEC.) =    1.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   22.07
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.642
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.06      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        2.29      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   12.13
  EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      29.05

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  460.3 FT WITH ELEVATION-DROP =   0.7 FT, IS   16.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     50.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   22.07
  RAINFALL INTENSITY(INCH/HR) =   2.64
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      29.05

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
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  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.408
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       3.82      0.25      0.100    86   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     11.63
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     11.63

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   3.41
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.63

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       29.05   22.07    2.642  0.25( 0.18) 0.74      13.1       0.00
      2       11.63   14.16    3.408  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       36.07   14.16    3.408  0.25( 0.14) 0.54      12.2      52.00
      2       38.05   22.07    2.642  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      38.05    Tc(MIN.) =    22.07
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
```



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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.75
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   34.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   3.13   Tc(MIN.) =   25.21
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.449
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C       0.67      0.25      0.100    86
  USER-DEFINED               -       1.94      0.25      0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    5.41
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      40.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.72
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.37
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      45.42
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.65   SPLIT FLOOD WIDTH(FEET) =   28.59
    SPLIT FLOW(CFS) =   19.38   SPLIT VELOCITY(FEET/SEC.) =    2.34
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   27.15
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.346
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  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    9.84
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      48.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      57.49
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.80
    HALFSTREET FLOOD WIDTH(FEET) =   38.87
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.69
  STREET FLOW TRAVEL TIME(MIN.) =   4.55   Tc(MIN.) =   31.70
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.147
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   17.89
  EFFECTIVE AREA(ACRES) =     33.76    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      62.07

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.82   HALFSTREET FLOOD WIDTH(FEET) =  39.84
  FLOW VELOCITY(FEET/SEC.) =  2.15   DEPTH*VELOCITY(FT*FT/SEC.) =   1.77
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
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        AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   28.8 CFS,
        WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       63.82   23.77    2.532  0.25( 0.09) 0.36      29.0      52.00
      2       62.07   31.70    2.147  0.25( 0.10) 0.42      33.8       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      63.82  Tc(MIN.) =   23.77
  AREA-AVERAGED Fm(INCH/HR) =  0.09  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.36  EFFECTIVE AREA(ACRES) =      29.05
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     23.77
  EFFECTIVE AREA(ACRES) =     29.05  AREA-AVERAGED Fm(INCH/HR)=  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.364
  PEAK FLOW RATE(CFS)   =      63.82

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       63.82   23.77    2.532  0.25( 0.09) 0.36      29.0      52.00
      2       62.07   31.70    2.147  0.25( 0.10) 0.42      33.8       0.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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| |                                                                                                  | |
| |          Ripcurl Preliminary Hydrology Study Existing Conditions: 10-year Storm Event            | |
| |                                                                                                  | |
| |-------------------------------------------[ORANGE COUNTY]----------------------------------------| |
| |  FILE NAME:E10.DAT                          *ENGLISH UNITS*            | CALCULATED BY:          | |
| |  TIME/DATE OF STUDY: 22:26   6/ 7/2008                                 |    CHECKED BY:          | |
| |  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                | PAGE NUMBER   1 OF      | |
| |---------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]--------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS  | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.|(in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|  AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |        10.00|    1.2|   1.2| C |Grass|----|  9.6|2.79|0.25|0.250|   2.8|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.3|Qest.=   4.0  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.43;D*V= 0.6| |
| | FLOW TO PT.#|       |      |   |     | 2.3|     |    |    |     |      |    |     |    |FLOODWIDTH=17.7| |
| |        20.00|    1.2|  2.44| C |Grass|----| 11.9|2.47|0.25|0.250|   4.9|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.4|Qest.=   6.4  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.50;D*V= 0.7| |
| | FLOW TO PT.#|       |      |   |     | 2.9|     |    |    |     |      |    |     |    |FLOODWIDTH=21.2| |
| |        30.00|    1.8|  4.23| C |Grass|----| 14.8|2.18|0.25|0.250|   7.3|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.6|Qest.=  10.1  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.58;D*V= 0.9| |
| | FLOW TO PT.#|    0.7|      | C | Com | 4.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=25.2| |
| |        40.00|    2.8|  7.79| C |Grass|----| 18.9|1.90|0.25|0.229|  11.7|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  15.4  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.67;D*V= 1.2| |
| | FLOW TO PT.#|    3.1|      | C | Com | 4.4|     |    |0.03|     |      |    |     |    |FLOODWIDTH=29.7| |
| |        50.00|    2.3| 13.14| C |Grass|----| 23.3|1.68|0.25|0.185|  17.7|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |        50.00|       |  13.1|   |     |----| 23.3|1.68|    |     |  17.7|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 610|.0017| .. |INITIAL SUBAREA| |
| |        50.00|    3.8|   3.8| C | Com |----| 14.2|2.24|0.03|0.025|   7.6|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |  CONFLUENCE |                    PEAK FLOW RATE =       23.4 (cfs)                     |              | |
| |   ANALYSIS  |                    TIME OF CONCENTRATION(MIN.) =   23.3                  |    LARGEST   | |
| |  FOR POINT# |      MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)   |  CONFLUENCE  | |
| |        50.00|      EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =      16.95 (Acres)|  Q=      23.4| |
| |             |    Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |              | |
| |             |    22.33     14.16    0.250     0.53    0.133      2.24     11.80     52.0|              | |
| |             |    23.37     23.31    0.250     0.60    0.149      1.68     16.95      0.0|              | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  25.0  | |
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| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        55.00|    1.9| 19.57| C | Com |----| 26.5|1.56|0.19|0.148|  24.9|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  28.0  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 19.17| C |Grass|----| 19.3|1.50|0.25|0.114|  30.3|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 1.9|Qest.=  37.1  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.3| |
| | FLOW TO PT.#|    8.8|      | C | Com | 5.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        70.00|    0.6| 28.60| C |Grass|----| 24.5|1.63|0.25|0.090|  39.7|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |        70.00|       |  28.6|   |     |----| 24.5|    |    |     |  39.7|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| | EFFECTIVE AREA =      28.60 Acres  TOTAL AREA =      33.76 Acres  PEAK FLOW RATE =     39.73 cfs      | |
| | TIME OF CONCENTRATION(MIN.)=    24.50  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.358; Fm =  0.090 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |             |      PEAK FLOW RATE TABLE                                                 |              | |
| |             |    Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |              | |
| |             |    39.73     24.50    0.250     0.36    0.090      1.63     28.60     52.0|              | |
| |             |    38.20     33.65    0.250     0.42    0.104      1.36     33.76      0.0|              | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |              | |
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| |                                                                                                  | |
| |          Ripcurl Preliminary Hydrology Study Existing Conditions: 25-year Storm Event            | |
| |                                                                                                  | |
| |-------------------------------------------[ORANGE COUNTY]----------------------------------------| |
| |  FILE NAME:E25.DAT                          *ENGLISH UNITS*            | CALCULATED BY:          | |
| |  TIME/DATE OF STUDY: 22:28   6/ 7/2008                                 |    CHECKED BY:          | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                | PAGE NUMBER   1 OF      | |
| |---------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]--------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS  | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.|(in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|  AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|--------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
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| |       10.00|    1.2|    1.2| C |Grass|----|  9.6|3.33|0.25|0.250|   3.4|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.4|Qest.=    4.9  | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.45;D*V= 0.6| |
| | FLOW TO PT.#|      |       |   |     | 2.2|     |    |    |     |      |    |     |    |FLOODWIDTH=19.0| |
| |       20.00|    1.2|   2.44| C |Grass|----| 11.8|2.97|0.25|0.250|   6.0|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.5|Qest.=    7.9  | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.53;D*V= 0.8| |
| | FLOW TO PT.#|      |       |   |     | 2.8|     |    |    |     |      |    |     |    |FLOODWIDTH=23.0| |
| |       30.00|    1.8|   4.23| C |Grass|----| 14.6|2.63|0.25|0.250|   9.1|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.7|Qest.=  12.5   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.62;D*V= 1.1| |
| | FLOW TO PT.#|   0.7|       | C | Com | 3.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=27.3| |
| |       40.00|    2.8|   7.79| C |Grass|----| 18.4|2.30|0.25|0.229|  14.6|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  19.2   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   3.1|       | C | Com | 4.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       50.00|    2.3|  13.14| C |Grass|----| 22.7|2.05|0.25|0.185|  22.1|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       50.00|       |   13.1|   |     |----| 22.7|2.05|    |     |  22.1|----|-----|----|FOR CONFLUENCE | |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |       |       |   |     | .. |     |    |    |     |      | 610|.0017| .. |INITIAL SUBAREA| |
| |       50.00|    3.8|    3.8| C | Com |----| 14.2|2.68|0.03|0.025|   9.1|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | CONFLUENCE |                  PEAK FLOW RATE =        29.0 (cfs)                       |               | |
| |  ANALYSIS  |                  TIME OF CONCENTRATION(MIN.) =   22.7                      |    LARGEST    | |
| | FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)    |   CONFLUENCE  | |
| |       50.00|     EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =      16.95 (Acres)|   Q=      29.0| |
| |            |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |            |   27.52     14.16    0.250     0.54    0.134      2.68     12.03     52.0|               | |
| |            |   29.02     22.66    0.250     0.60    0.149      2.05     16.95      0.0|               | |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  31.1   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   0.7|       | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       55.00|    1.9|  19.57| C | Com |----| 25.8|1.90|0.19|0.148|  30.9|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  34.7   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|   4.2|       | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       60.00|    0.5|  19.40| C |Grass|----| 19.3|1.83|0.25|0.115|  37.2|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.0|Qest.=  45.5   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.77;D*V= 1.5| |
| | FLOW TO PT.#|   8.8|       | C | Com | 4.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=36.2| |
| |       70.00|    0.6|  28.83| C |Grass|----| 24.2|1.98|0.25|0.090|  48.9|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       70.00|       |   28.8|   |     |----| 24.2|    |    |     |  48.9|----|-----|----|STREAM SUMMARY | |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.83 Acres  TOTAL AREA =     33.76 Acres  PEAK FLOW RATE =      48.94 cfs      | |
| | TIME OF CONCENTRATION(MIN.)=   24.18  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.361; Fm =  0.090 (in/hr)| |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |     PEAK FLOW RATE TABLE                                                   |               | |
| |            |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |            |   48.94     24.18    0.250     0.36    0.090      1.98     28.83     52.0|               | |
| |            |   47.42     32.74    0.250     0.42    0.104      1.67     33.76      0.0|               | |
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| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |       |       |   |     |    |     |    |    |     |      |    |     |    |               | |
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| |                                                                                                      | |
| |        Ripcurl Preliminary Hydrology Study Existing Conditions: 50-year Storm Event                  | |
| |                                                                                                      | |
| |------------------------------------------[ORANGE COUNTY]---------------------------------------------| |
| |  FILE NAME:E50.DAT                         *ENGLISH UNITS*               | CALCULATED BY:            | |
| |  TIME/DATE OF STUDY: 22:29    6/ 7/2008                                  |    CHECKED BY:            | |
| |  50.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                  | PAGE NUMBER   1 OF        | |
| |---------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc |  I | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)| (cfs)|(ft)|ft/ft|FPS.|   AND NOTES   | |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |       |       |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |       10.00|    1.2|    1.2| C |Grass|----|  9.6|3.76|0.25|0.250|   3.8|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.4|Qest.=    5.6  | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.47;D*V= 0.7| |
| | FLOW TO PT.#|      |       |   |     | 2.1|     |    |    |     |      |    |     |    |FLOODWIDTH=20.0| |
| |       20.00|    1.2|   2.44| C |Grass|----| 11.7|3.36|0.25|0.250|   6.8|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.6|Qest.=    9.0  | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.56;D*V= 0.9| |
| | FLOW TO PT.#|      |       |   |     | 2.7|     |    |    |     |      |    |     |    |FLOODWIDTH=24.2| |
| |       30.00|    1.8|   4.23| C |Grass|----| 14.4|2.99|0.25|0.250|  10.4|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  14.3   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.65;D*V= 1.2| |
| | FLOW TO PT.#|   0.7|       | C | Com | 3.7|     |    |0.03|     |      |    |     |    |FLOODWIDTH=28.8| |
| |       40.00|    2.8|   7.79| C |Grass|----| 18.1|2.62|0.25|0.229|  16.8|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  22.1   | |
| | 64.ft-STREET|      |       |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   3.1|       | C | Com | 4.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       50.00|    2.3|  13.14| C |Grass|----| 22.4|2.33|0.25|0.185|  25.4|----|-----|----|---------------| |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       50.00|       |   13.1|   |     |----| 22.4|2.33|    |     |  25.4|----|-----|----|FOR CONFLUENCE | |
| |------------|-------|-------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |       |       |   |     | .. |     |    |    |     |      | 610|.0017| .. |INITIAL SUBAREA| |
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| |        50.00|   3.8|   3.8| C | Com |----| 14.2|3.02|0.03|0.025|  10.3|----|-----|----|---------------| |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                    PEAK FLOW RATE =       33.3 (cfs)                  |               | |
| |   ANALYSIS  |                    TIME OF CONCENTRATION(MIN.) =   22.4               |    LARGEST    | |
| |  FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)  |   CONFLUENCE  | |
| |        50.00|     EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =      16.95 (Acres)|   Q=      33.3| |
| |             |    Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |    31.49      14.16    0.250     0.54    0.135      3.02     12.14     52.0|               | |
| |             |    33.28      22.35    0.250     0.60    0.149      2.33     16.95      0.0|               | |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  35.6   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        55.00|   1.9| 19.57| C | Com |----| 25.5|2.16|0.19|0.148|  35.4|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  39.8   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|   4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|   0.5| 24.33| C |Grass|----| 27.5|2.07|0.25|0.129|  42.6|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.1|Qest.=  50.4   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.79;D*V= 1.6| |
| | FLOW TO PT.#|   8.8|      | C | Com | 4.7|     |    |0.03|     |      |    |     |    |FLOODWIDTH=37.3| |
| |        70.00|   0.6| 28.94| C |Grass|----| 24.0|1.89|0.25|0.091|  56.0|----|-----|----|---------------| |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|      |  28.9|   |     |----| 24.0|    |    |     |  56.0|----|-----|----|STREAM SUMMARY | |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.94 Acres  TOTAL AREA =     33.76 Acres  PEAK FLOW RATE =      55.95 cfs     | |
| | TIME OF CONCENTRATION(MIN.)=   23.98  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.363; Fm =  0.091 (in/hr)| |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |     PEAK FLOW RATE TABLE                                                 |               | |
| |             |    Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |    55.95      23.98    0.250     0.36    0.091      2.24     28.94     52.0|               | |
| |             |    54.38      32.22    0.250     0.42    0.104      1.89     33.76      0.0|               | |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |      |      |   |     |    |     |    |    |     |      |    |     |    |               | |
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| |          Ripcurl Preliminary Hydrology Study Existing Conditions: 100-year Storm Event                | |
| |                                                                                                       | |
| |                                                                                                       | |
| |-------------------------------------------[ORANGE COUNTY]---------------------------------------------| |
| | FILE NAME:E100.DAT                          *ENGLISH UNITS*                  | CALCULATED BY:         | |
| | TIME/DATE OF STUDY: 22:30   6/ 7/2008                                        |    CHECKED BY:         | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)                      | PAGE NUMBER   1 OF     | |
| |---------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc |  I | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES   | |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |      |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |        10.00|   1.2|   1.2| C |Grass|----|  9.6|4.26|0.25|0.250|   4.4|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.5|Qest.=   6.3   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.50;D*V= 0.7| |
| | FLOW TO PT.#|      |      |   |     | 2.0|     |    |    |     |      |    |     |    |FLOODWIDTH=21.1| |
| |        20.00|   1.2|  2.44| C |Grass|----| 11.6|3.82|0.25|0.250|   7.8|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.6|Qest.=  10.4   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.58;D*V= 1.0| |
| | FLOW TO PT.#|      |      |   |     | 2.6|     |    |    |     |      |    |     |    |FLOODWIDTH=25.5| |
| |        30.00|   1.8|  4.23| C |Grass|----| 14.2|3.40|0.25|0.250|  12.0|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  16.4   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.68;D*V= 1.2| |
| | FLOW TO PT.#|   0.7|      | C | Com | 3.6|     |    |0.03|     |      |    |     |    |FLOODWIDTH=31.1| |
| |        40.00|   2.8|  7.79| C |Grass|----| 17.9|2.98|0.25|0.229|  19.3|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  25.4   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   3.1|      | C | Com | 4.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        50.00|   2.3| 13.14| C |Grass|----| 22.1|2.64|0.25|0.185|  29.0|----|-----|----|---------------| |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        50.00|      |  13.1|   |     |----| 22.1|2.64|    |     |  29.0|----|-----|----|FOR CONFLUENCE | |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |      |      |   |     | .. |     |    |    |     |      | 610|.0017| .. |INITIAL SUBAREA| |
| |        50.00|   3.8|   3.8| C | Com |----| 14.2|3.41|0.03|0.025|  11.6|----|-----|----|---------------| |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                    PEAK FLOW RATE =       38.0 (cfs)                  |               | |
| |   ANALYSIS  |                    TIME OF CONCENTRATION(MIN.) =   22.1               |    LARGEST    | |
| |  FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)  |   CONFLUENCE  | |
| |        50.00|     EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =      16.95 (Acres)|   Q=      38.0| |
| |             |    Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |    36.07      14.16    0.250     0.54    0.135      3.41     12.24     52.0|               | |
| |             |    38.05      22.07    0.250     0.60    0.149      2.64     16.95      0.0|               | |
| |-------------|------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  40.8   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.4| |
| | FLOW TO PT.#|   0.7|      | C | Com | 3.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.8| |
| |        55.00|   1.9| 19.57| C | Com |----| 25.2|2.45|0.19|0.148|  40.5|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  45.4   | |
| | 64.ft-STREET|      |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|   4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|   0.5| 24.33| C |Grass|----| 27.2|2.35|0.25|0.129|  48.5|----|-----|----|---------------| |
| |-------------|------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.1|Qest.=  57.5   | |
```

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********************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
                (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                              Analysis prepared by:
                            Sabrina Cook, Ph.D  PBS&J

Existing Conditions with Proposed Project:  10-year

 -------------------------------------------------------------------------------
  FILE NAME: PPE10.DAT
  TIME/DATE OF STUDY: 22:31 06/07/2008
 ===============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 *******************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 -------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.793
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25     1.000    86    9.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.78
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.78
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| | 64.ft-STREET|       |      |   |     |    |     |    |0.03|     |      |    |     |    |D=0.82;D*V= 1.8| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.5|     |    |    |     |      |    |     |    |FLOODWIDTH=38.9| |
| |        70.00|    0.6| 29.05| C |Grass|----| 23.8|2.15|0.25|0.091|  63.8|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  29.0|   |     |----| 23.8|    |    |     |  63.8|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      29.05 Acres  TOTAL AREA =      33.76 Acres  PEAK FLOW RATE =       63.82 cfs    | |
| | TIME OF CONCENTRATION(MIN.)=    23.77  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.364; Fm =  0.091 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |    PEAK FLOW RATE TABLE                                                 |               | |
| |             |  Q(cfs)    Tc(min)   Fp(avg)   Ap(avg)   Fm(avg)   I(in/hr)   Ae(Acres)   NODE|               | |
| |             |  63.82      23.77     0.250      0.36     0.091       2.53       29.05     52.0|               | |
| |             |  62.07      31.70     0.250      0.42     0.104       2.15       33.76      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
| |---------------------------------------------------------------------------------------------------| |
| * *                                                                                                 * * |
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  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.01
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.43
    HALFSTREET FLOOD WIDTH(FEET) =   17.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.24
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
  STREET FLOW TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   11.86
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.474
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    2.45
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       4.88

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  19.09
  FLOW VELOCITY(FEET/SEC.) =  1.30   DEPTH*VELOCITY(FT*FT/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300
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    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.50
    HALFSTREET FLOOD WIDTH(FEET) =   21.22
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.40
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   2.95   Tc(MIN.) =   14.81
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.179
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.79      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    3.11
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =       7.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.52   HALFSTREET FLOOD WIDTH(FEET) =  22.34
  FLOW VELOCITY(FEET/SEC.) =  1.44   DEPTH*VELOCITY(FT*FT/SEC.) =   0.75
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.06
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.58
    HALFSTREET FLOOD WIDTH(FEET) =   25.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.56
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
  STREET FLOW TRAVEL TIME(MIN.) =   4.08   Tc(MIN.) =   18.89
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.895
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.74      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.81      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
  SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    5.42
  EFFECTIVE AREA(ACRES) =      7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
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  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      11.68

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.61   HALFSTREET FLOOD WIDTH(FEET) =  26.66
  FLOW VELOCITY(FEET/SEC.) =  1.62   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.67
    HALFSTREET FLOOD WIDTH(FEET) =   29.69
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.73
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
  STREET FLOW TRAVEL TIME(MIN.) =   4.42   Tc(MIN.) =   23.31
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.680
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA       Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.06      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.29      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =    7.50
  EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      17.68

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.70   HALFSTREET FLOOD WIDTH(FEET) =  32.82
  FLOW VELOCITY(FEET/SEC.) =  1.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.25
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   23.31
  RAINFALL INTENSITY(INCH/HR) =   1.68
  AREA-AVERAGED Fm(INCH/HR) =  0.18
```



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  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.68

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.579
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA       Fp          Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      8.78
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =      8.78

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   2.58
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.78

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1       17.68   23.31    1.680  0.25( 0.18) 0.74      13.1       0.00
      2        8.78   11.04    2.579  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1       22.18   11.04    2.579  0.25( 0.12) 0.50      10.0      52.00
      2       23.37   23.31    1.680  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.37    Tc(MIN.) =    23.31
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
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  TOTAL AREA(ACRES) =       17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.03
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.47   SPLIT FLOOD WIDTH(FEET) =   19.59
    SPLIT FLOW(CFS) =    5.42   SPLIT VELOCITY(FEET/SEC.) =    1.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   26.48
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.562
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C       0.67      0.25     0.100    69
  USER-DEFINED               -       1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    3.33
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      24.88

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.99
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.31   SPLIT FLOOD WIDTH(FEET) =   11.65
    SPLIT FLOW(CFS) =    1.94   SPLIT VELOCITY(FEET/SEC.) =    1.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   28.43
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.500
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C       4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C       0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    6.21
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      30.00

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       30.80   16.16    2.073  0.25( 0.11) 0.43      17.4      52.00
      2       30.00   28.43    1.500  0.25( 0.13) 0.52      24.3       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      30.80  Tc(MIN.) =   16.16
  AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.43  EFFECTIVE AREA(ACRES) =      17.41
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      38.14
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.41
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.31
  STREET FLOW TRAVEL TIME(MIN.) =   5.22   Tc(MIN.) =   21.38
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.766
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                     C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   14.65
  EFFECTIVE AREA(ACRES) =     26.84    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      40.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.73   HALFSTREET FLOOD WIDTH(FEET) =  35.02
  FLOW VELOCITY(FEET/SEC.) =  1.87   DEPTH*VELOCITY(FT*FT/SEC.) =   1.36
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   18.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     21.38
  EFFECTIVE AREA(ACRES) =     26.84  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.333
  PEAK FLOW RATE(CFS)   =      40.64

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       40.64   21.38    1.766  0.25( 0.08) 0.33      26.8      52.00
      2       38.20   33.65    1.361  0.25( 0.10) 0.42      33.8       0.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS


 ____________________________________________________________________________
 ****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                              Analysis prepared by:
                            Sabrina Cook, Ph.D  PBS&J

Existing Conditions with Proposed Project:  25-year
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 ----------------------------------------------------------------------------
  FILE NAME: PPE25.DAT
  TIME/DATE OF STUDY: 22:38 06/07/2008
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.334
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                     C        1.22      0.25     1.000    86    9.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.37
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      3.37

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.45
    HALFSTREET FLOOD WIDTH(FEET) =   19.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.31
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.59
  STREET FLOW TRAVEL TIME(MIN.) =   2.15   Tc(MIN.) =   11.75
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.974
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25      1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.00
  EFFECTIVE AREA(ACRES) =       2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       5.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.49   HALFSTREET FLOOD WIDTH(FEET) =  20.59
  FLOW VELOCITY(FEET/SEC.) =  1.38   DEPTH*VELOCITY(FT*FT/SEC.) =   0.67
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.53
    HALFSTREET FLOOD WIDTH(FEET) =   22.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   2.80   Tc(MIN.) =   14.56
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.635
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
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  NATURAL POOR COVER
  "GRASS"                    C        1.79      0.25      1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    3.85
  EFFECTIVE AREA(ACRES) =       4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =       9.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.56   HALFSTREET FLOOD WIDTH(FEET) =  24.22
  FLOW VELOCITY(FEET/SEC.) =  1.52   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.45
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.62
    HALFSTREET FLOOD WIDTH(FEET) =   27.34
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.64
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.02
  STREET FLOW TRAVEL TIME(MIN.) =   3.88   Tc(MIN.) =   18.44
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.305
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.74      0.25      0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.81      0.25      1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
  SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    6.73
  EFFECTIVE AREA(ACRES) =       7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      14.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.65   HALFSTREET FLOOD WIDTH(FEET) =  28.97
  FLOW VELOCITY(FEET/SEC.) =  1.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      19.19
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.19   SPLIT FLOOD WIDTH(FEET) =    5.64
    SPLIT FLOW(CFS) =    0.29   SPLIT VELOCITY(FEET/SEC.) =    0.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   22.66
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.051
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.06      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.29      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =    9.28
  EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      22.06

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   22.66
  RAINFALL INTENSITY(INCH/HR) =   2.05
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      22.06

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



```
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.081
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.51
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     10.51

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.08
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       22.06   22.66    2.051  0.25( 0.18) 0.74      13.1       0.00
      2       10.51   11.04    3.081  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       27.18   11.04    3.081  0.25( 0.13) 0.50      10.2      52.00
      2       29.02   22.66    2.051  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.02    Tc(MIN.) =    22.66
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      31.09
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.60   SPLIT FLOOD WIDTH(FEET) =   26.09
    SPLIT FLOW(CFS) =   11.48   SPLIT VELOCITY(FEET/SEC.) =    1.66
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   25.83
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.904
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    69
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    4.13
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      30.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300
```



```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.72
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.49   SPLIT FLOOD WIDTH(FEET) =   21.03
    SPLIT FLOW(CFS) =    8.68   SPLIT VELOCITY(FEET/SEC.) =    1.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   27.78
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.827
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    7.62
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      37.18

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       37.61   16.16    2.483  0.25( 0.11) 0.43      17.6      52.00
      2       37.18   27.78    1.827  0.25( 0.13) 0.52      24.3       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      37.61  Tc(MIN.) =   16.16
  AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.43  EFFECTIVE AREA(ACRES) =      17.59
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      46.53
    ***STREET FLOWING FULL***
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  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.76
  HALFSTREET FLOOD WIDTH(FEET) =   36.42
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.96
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.48
STREET FLOW TRAVEL TIME(MIN.) =   4.86   Tc(MIN.) =   21.02
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.140
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  C        8.82      0.25     0.100    69
NATURAL POOR COVER
"GRASS"                     C        0.62      0.25     1.000    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   17.83
EFFECTIVE AREA(ACRES) =     27.02    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      49.99

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.77   HALFSTREET FLOOD WIDTH(FEET) =  37.22
FLOW VELOCITY(FEET/SEC.) =  2.01   DEPTH*VELOCITY(FT*FT/SEC.) =   1.55
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
       AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   22.6 CFS,
       WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00
LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     21.02
EFFECTIVE AREA(ACRES) =     27.02  AREA-AVERAGED Fm(INCH/HR)=  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.336
PEAK FLOW RATE(CFS)   =      49.99

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)     NODE
    1       49.99   21.02    2.140  0.25( 0.08) 0.34      27.0       52.00
    2       47.42   32.74    1.665  0.25( 0.10) 0.42      33.8        0.00
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS


____________________________________________________________________________
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2007 Advanced Engineering Software (aes)
            Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                         Sabrina Cook, Ph.D  PBS&J

Existing Conditions with Proposed Project:  50-year


 ---------------------------------------------------------------------------
  FILE NAME: PPE50.DAT
  TIME/DATE OF STUDY: 22:39 06/07/2008
 ===========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
```



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

  USER SPECIFIED STORM EVENT(YEAR) =   50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.758
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                     C        1.22      0.25     1.000    86    9.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.84
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      3.84

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300
```

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.55
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.47
    HALFSTREET FLOOD WIDTH(FEET) =   20.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.35
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.64
  STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =   11.69
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.363
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.43
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       6.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.51   HALFSTREET FLOOD WIDTH(FEET) =  21.72
  FLOW VELOCITY(FEET/SEC.) =  1.42   DEPTH*VELOCITY(FT*FT/SEC.) =   0.72
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.56
    HALFSTREET FLOOD WIDTH(FEET) =   24.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.52
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   2.71   Tc(MIN.) =   14.39
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.989
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        1.79      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    4.42
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
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  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      10.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.58   HALFSTREET FLOOD WIDTH(FEET) =  25.53
  FLOW VELOCITY(FEET/SEC.) =  1.57   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.65
    HALFSTREET FLOOD WIDTH(FEET) =   28.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.71
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.11
  STREET FLOW TRAVEL TIME(MIN.) =   3.74   Tc(MIN.) =   18.13
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.623
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.74      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.81      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
  SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    7.74
  EFFECTIVE AREA(ACRES) =      7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      16.78

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.69   HALFSTREET FLOOD WIDTH(FEET) =  31.57
  FLOW VELOCITY(FEET/SEC.) =  1.77   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.09
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.40   SPLIT FLOOD WIDTH(FEET) =   16.16
    SPLIT FLOW(CFS) =    3.19   SPLIT VELOCITY(FEET/SEC.) =    1.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   22.35
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.330
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.06      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        2.29      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   10.63
  EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      25.35

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   22.35
  RAINFALL INTENSITY(INCH/HR) =   2.33
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      25.35

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00
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  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.473
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     11.85
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     11.85

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.47
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.85

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.35   22.35    2.330  0.25( 0.18) 0.74      13.1       0.00
      2       11.85   11.04    3.473  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       31.05   11.04    3.473  0.25( 0.13) 0.50      10.3      52.00
      2       33.28   22.35    2.330  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.28    Tc(MIN.) =    22.35
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =       17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.64
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.67   SPLIT FLOOD WIDTH(FEET) =   29.69
    SPLIT FLOW(CFS) =   16.03   SPLIT VELOCITY(FEET/SEC.) =    1.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   25.53
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.161
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    69
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    4.73
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      35.44

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      39.77
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.58   SPLIT FLOOD WIDTH(FEET) =   25.09
    SPLIT FLOW(CFS) =   13.72   SPLIT VELOCITY(FEET/SEC.) =    2.14
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    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   27.47
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.073
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    8.67
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      42.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       42.81   16.16    2.799  0.25( 0.11) 0.43      17.7      52.00
      2       42.55   27.47    2.073  0.25( 0.13) 0.52      24.3       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      42.81  Tc(MIN.) =   16.16
  AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.43  EFFECTIVE AREA(ACRES) =      17.68
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      52.95
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.78
    HALFSTREET FLOOD WIDTH(FEET) =   37.89
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.61
  STREET FLOW TRAVEL TIME(MIN.) =   4.67   Tc(MIN.) =   20.83
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.425
```

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  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   20.25
  EFFECTIVE AREA(ACRES) =     27.11    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       33.8        PEAK FLOW RATE(CFS) =      57.10

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.80   HALFSTREET FLOOD WIDTH(FEET) =  38.80
  FLOW VELOCITY(FEET/SEC.) =  2.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.68
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   25.5 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
 ============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.8  TC(MIN.) =     20.83
  EFFECTIVE AREA(ACRES) =     27.11  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.337
  PEAK FLOW RATE(CFS)   =      57.10

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       57.10   20.83    2.425  0.25( 0.08) 0.34      27.1      52.00
      2       54.38   32.22    1.894  0.25( 0.10) 0.42      33.8       0.00
 ============================================================================
 ============================================================================
  END OF RATIONAL METHOD ANALYSIS


 ____________________________________________________________________________
 ****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                           Analysis prepared by:
                         Sabrina Cook, Ph.D  PBS&J

Existing Conditions with Proposed Project:  100-year


 ---------------------------------------------------------------------------
  FILE NAME: PPE100.DAT
  TIME/DATE OF STUDY: 22:39 06/07/2008
 ============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*
```



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  *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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.602
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.257
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                    C        1.22      0.25     1.000    97    9.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      4.38
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      4.38

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.35
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.50
    HALFSTREET FLOOD WIDTH(FEET) =   21.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.39
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
```

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  STREET FLOW TRAVEL TIME(MIN.) =   2.02   Tc(MIN.) =   11.62
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.816
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        1.22      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.93
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       7.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  22.84
  FLOW VELOCITY(FEET/SEC.) =  1.47   DEPTH*VELOCITY(FT*FT/SEC.) =   0.78
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.58
    HALFSTREET FLOOD WIDTH(FEET) =   25.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.57
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.92
  STREET FLOW TRAVEL TIME(MIN.) =   2.62   Tc(MIN.) =   14.24
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.397
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        1.79      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    5.08
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      11.99

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.61   HALFSTREET FLOOD WIDTH(FEET) =  26.91
  FLOW VELOCITY(FEET/SEC.) =  1.63   DEPTH*VELOCITY(FT*FT/SEC.) =   1.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.
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****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.68
    HALFSTREET FLOOD WIDTH(FEET) =   31.07
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.20
  STREET FLOW TRAVEL TIME(MIN.) =   3.62   Tc(MIN.) =   17.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.984
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.74      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                     C        2.81      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.812
  SUBAREA AREA(ACRES) =    3.56      SUBAREA RUNOFF(CFS) =    8.90
  EFFECTIVE AREA(ACRES) =      7.79    AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        7.8        PEAK FLOW RATE(CFS) =      19.31

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300
```

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    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.38
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.50   SPLIT FLOOD WIDTH(FEET) =   21.28
    SPLIT FLOW(CFS) =    6.47   SPLIT VELOCITY(FEET/SEC.) =    1.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   22.07
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.642
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.06      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        2.29      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.486
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   12.13
  EFFECTIVE AREA(ACRES) =     13.14    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.74
  TOTAL AREA(ACRES) =       13.1        PEAK FLOW RATE(CFS) =      29.05

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  460.3 FT WITH ELEVATION-DROP =   0.7 FT, IS   16.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     50.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   22.07
  RAINFALL INTENSITY(INCH/HR) =   2.64
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.74
  EFFECTIVE STREAM AREA(ACRES) =      13.14
  TOTAL STREAM AREA(ACRES) =      13.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      29.05

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.930
```



```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    86   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     13.43
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     13.43

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.93
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.43

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       29.05   22.07    2.642  0.25( 0.18) 0.74      13.1       0.00
      2       13.43   11.04    3.930  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       35.57   11.04    3.930  0.25( 0.13) 0.50      10.4      52.00
      2       38.05   22.07    2.642  0.25( 0.15) 0.60      17.0       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      38.05    Tc(MIN.) =    22.07
  EFFECTIVE AREA(ACRES) =      16.95   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =      17.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
```

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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.75
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   34.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   3.13   Tc(MIN.) =   25.21
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.449
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    86
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    5.41
  EFFECTIVE AREA(ACRES) =     19.57    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.59
  TOTAL AREA(ACRES) =       19.6        PEAK FLOW RATE(CFS) =      40.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.72
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.37
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      45.42
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.65   SPLIT FLOOD WIDTH(FEET) =   28.59
    SPLIT FLOW(CFS) =   19.38   SPLIT VELOCITY(FEET/SEC.) =    2.34
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   27.15
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.346
  SUBAREA LOSS RATE DATA(AMC III):
```



```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    9.84
  EFFECTIVE AREA(ACRES) =     24.33    AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.52
  TOTAL AREA(ACRES) =       24.3        PEAK FLOW RATE(CFS) =      48.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       48.77   16.15    3.160  0.25( 0.11) 0.43      17.8       52.00
      2       48.54   27.15    2.346  0.25( 0.13) 0.52      24.3        0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      48.77  Tc(MIN.) =   16.15
  AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.43  EFFECTIVE AREA(ACRES) =      17.76
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      60.28
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.81
    HALFSTREET FLOOD WIDTH(FEET) =   39.41
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.13
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.74
  STREET FLOW TRAVEL TIME(MIN.) =   4.47   Tc(MIN.) =   20.62
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.747
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
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Existing Conditions with Proposed Project Detailed Output.txt
SUBAREA AREA(ACRES) =      9.43   SUBAREA RUNOFF(CFS) =      22.98
EFFECTIVE AREA(ACRES) =   27.19    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =       33.8      PEAK FLOW RATE(CFS) =      65.15

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.84   HALFSTREET FLOOD WIDTH(FEET) =  40.45
FLOW VELOCITY(FEET/SEC.) =  2.18   DEPTH*VELOCITY(FT*FT/SEC.) =   1.82
*NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,   28.8 CFS,
       AND L =  573.0 FT WITH ELEVATION-DROP =  0.9 FT, IS      70.00
       WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE  2795.80 FEET.
LONGEST FLOWPATH FROM NODE      0.00 TO NODE      70.00 =
==========================================================================
END OF STUDY SUMMARY:                   33.8  TC(MIN.) =       20.62
TOTAL AREA(ACRES)                  =    27.19  AREA-AVERAGED Fm(INCH/HR)=  0.08
EFFECTIVE AREA(ACRES)              =     0.25  AREA-AVERAGED Ap = 0.339
AREA-AVERAGED Fp(INCH/HR)          =    65.15
PEAK FLOW RATE(CFS)                =

** PEAK FLOW RATE TABLE **
 STREAM        Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER      (CFS)  (MIN.) (INCH/HR) (INCH/HR)                (ACRES)    NODE
   1         65.15   20.62    2.747  0.25( 0.08) 0.34      27.2      52.00
   2         62.07   31.70    2.147  0.25( 0.10) 0.42      33.8       0.00
==========================================================================
==========================================================================
END OF RATIONAL METHOD ANALYSIS
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Ripcurl Preliminary Hydrology Study Existing Conditions with Proposed Project: 10-year Storm Event

                                   [ORANGE COUNTY]
  FILE NAME:PPE10.DAT                    *ENGLISH UNITS*          CALCULATED BY:
  TIME/DATE OF STUDY: 22:31   6/ 7/2008                           CHECKED BY:
  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)          PAGE NUMBER   1 OF
                        [(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]
 CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V |   HYDRAULICS
  POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN. |(in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES
 ------------|------|------|---|----|---|-----|----|----|----|-----|---|-----|---|-------------
 ------------|------|------|---|----|---|-----|----|----|----|-----|---|-----|---|-------------
                                                                        312|.0478| .. |INITIAL SUBAREA
        10.00|   1.2|   1.2| C |Grass|--|   9.6|2.79|0.25|0.250|  2.8|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 168|.0016| 1.3|Qest.=   4.0
  64.ft-STREET                                                                          D=0.43;D*V= 0.6
  FLOW TO PT.#                                2.3                                       FLOODWIDTH=17.7
        20.00|   1.2|  2.44| C |Grass|----| 11.9|2.47|0.25|0.250|  4.9|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 247|.0016| 1.4|Qest.=   6.4
  64.ft-STREET                                                                          D=0.50;D*V= 0.7
  FLOW TO PT.#                                2.9                                       FLOODWIDTH=21.2
        30.00|   1.8|  4.23| C |Grass|----| 14.8|2.18|0.25|0.250|  7.3|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 382|.0016| 1.6|Qest.=  10.1
  64.ft-STREET                                                                          D=0.58;D*V= 0.9
  FLOW TO PT.#   0.7|      | C | Com | 4.1|     |    |0.03|    |     |   |     |   |FLOODWIDTH=25.2
        40.00|   2.8|  7.79| C |Grass|----| 18.9|1.90|0.25|0.229| 11.7|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 460|.0016| 1.8|Qest.=  15.4
  64.ft-STREET                                                                          D=0.67;D*V= 1.2
  FLOW TO PT.#   3.1|      | C | Com | 4.4|     |    |0.03|    |     |   |     |   |FLOODWIDTH=29.7
        50.00|   2.3| 13.14| C |Grass|----| 23.3|1.68|0.25|0.185| 17.7|---|-----|---|-------------
 ------------|------|------|---|----|---|-----|----|----|----|-----|---|-----|---|-------------
        50.00|      | 13.1 |   |    |----| 23.3|1.68|    |    | 17.7|---|-----|---|FOR CONFLUENCE
 ------------|------|------|---|----|---|-----|----|----|----|-----|---|-----|---|-------------
                                                                        794|.0100| .. |INITIAL SUBAREA
        50.00|   3.8|   3.8| C | Com |--|  11.0|2.58|0.03|0.025|  8.8|---|-----|---|-------------
 ------------|------|------|---|----|---|-----|----|----|----|-----|---|-----|---|-------------
   CONFLUENCE                   PEAK FLOW RATE =       23.4 (cfs)
    ANALYSIS                    TIME OF CONCENTRATION(MIN.) =   23.3                  LARGEST
   FOR POINT#      MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)   CONFLUENCE
        50.00      EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =     16.95 (Acres)  Q=      23.4
                 Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE
                 22.18     11.04    0.250     0.50    0.124     2.58     10.04     52.0
                 23.37     23.31    0.250     0.60    0.149     1.68     16.95      0.0
 ------------|------|------|---|----|---|-----|----|----|----|-----|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 358|.0017| 1.9|Qest.=  25.0
  64.ft-STREET                                                                          D=0.71;D*V= 1.3
  FLOW TO PT.#   0.7|      | C | Com | 3.2|     |    |0.03|    |     |   |     |   |FLOODWIDTH=34.4
        55.00|   1.9| 19.57| C | Com |----| 26.5|1.56|0.19|0.148| 24.9|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 292|.0030| 2.5|Qest.=  28.0
  64.ft-STREET                                                                          D=0.71;D*V= 1.8
  FLOW TO PT.#   4.2|      | C | Com | 1.9|     |    |0.03|    |     |   |     |   |FLOODWIDTH=34.4
        60.00|   0.5| 17.41| C |Grass|----| 16.2|1.50|0.25|0.107| 30.8|---|-----|---|-------------
 ------------|------|------|---|----|   |-----|----|----|----|-----| 573|.0016| 1.9|Qest.=  38.1
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| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.73;D*V= 1.4| |
| | FLOW TO PT.#|    8.8|      | C | Com | 5.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        70.00|    0.6| 26.84| C |Grass|----| 21.4|1.77|0.25|0.083|  40.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  26.8|   |     |----| 21.4|    |    |     |  40.6|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      26.84 Acres  TOTAL AREA =     33.76 Acres  PEAK FLOW RATE =      40.64 cfs      | |
| | TIME OF CONCENTRATION(MIN.)=   21.38  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.333; Fm =  0.083 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |      PEAK FLOW RATE TABLE                                                |               | |
| |             |    Q(cfs)    Tc(min)  Fp(avg)   Ap(avg)   Fm(avg)   I(in/hr)  Ae(Acres)  NODE |               | |
| |             |    40.64     21.38     0.250     0.33     0.083      1.77     26.84      52.0|               | |
| |             |    38.20     33.65     0.250     0.42     0.104      1.36     33.76       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |  Ripcurl Preliminary Hydrology Study Existing Conditions with Proposed Project: 25-year Storm Event    | |
| |                                                                                                       | |
| |-----------------------------------------[ORANGE COUNTY]-----------------------------------------------| |
| |  FILE NAME:PPE25.DAT                       *ENGLISH UNITS*               | CALCULATED BY:             | |
| |  TIME/DATE OF STUDY: 22:38   6/ 7/2008                                    |     CHECKED BY:            | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                   | PAGE NUMBER   1 OF         | |
| |---------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]-------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS  | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |        10.00|    1.2|   1.2| C |Grass|----|  9.6|3.33|0.25|0.250|   3.4|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.4|Qest.=    4.9  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.45;D*V= 0.6| |
| | FLOW TO PT.#|       |      |   |     | 2.2|     |    |    |     |      |    |     |    |FLOODWIDTH=19.0| |
| |        20.00|    1.2|  2.44| C |Grass|----| 11.8|2.97|0.25|0.250|   6.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.5|Qest.=    7.9  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.53;D*V= 0.8| |
| | FLOW TO PT.#|       |      |   |     | 2.8|     |    |    |     |      |    |     |    |FLOODWIDTH=23.0| |
| |        30.00|    1.8|  4.23| C |Grass|----| 14.6|2.63|0.25|0.250|   9.1|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.7|Qest.=   12.5  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.62;D*V= 1.1| |
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| | FLOW TO PT.#|    0.7|      | C | Com | 3.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=27.3| |
| |        40.00|    2.8|  7.79| C |Grass|----| 18.4|2.30|0.25|0.229|  14.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=   19.2  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    3.1|      | C | Com | 4.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        50.00|    2.3| 13.14| C |Grass|----| 22.7|2.05|0.25|0.185|  22.1|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        50.00|       |  13.1|   |     |----| 22.7|2.05|    |     |  22.1|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 794|.0100| .. |INITIAL SUBAREA| |
| |        50.00|    3.8|   3.8| C | Com |----| 11.0|3.08|0.03|0.025|  10.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                     PEAK FLOW RATE =        29.0 (cfs)                |               | |
| |   ANALYSIS  |                     TIME OF CONCENTRATION(MIN.) =    22.7             |    LARGEST    | |
| |  FOR POINT# |      MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)     |   CONFLUENCE  | |
| |        50.00|      EFFECTIVE AREA =       16.95 (Acres);  TOTAL AREA =      16.95 (Acres)|   Q=      29.0| |
| |             |    Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |    27.18     11.04     0.250     0.50    0.125      3.08     10.22      52.0|               | |
| |             |    29.02     22.66     0.250     0.60    0.149      2.05     16.95       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=   31.1  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        55.00|    1.9| 19.57| C | Com |----| 25.8|1.90|0.19|0.148|  30.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=   34.7  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 17.59| C |Grass|----| 16.2|1.83|0.25|0.108|  37.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.0|Qest.=   46.5  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.77;D*V= 1.5| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=36.4| |
| |        70.00|    0.6| 27.02| C |Grass|----| 21.0|2.14|0.25|0.084|  50.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  27.0|   |     |----| 21.0|    |    |     |  50.0|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      27.02 Acres  TOTAL AREA =     33.76 Acres  PEAK FLOW RATE =      49.99 cfs      | |
| | TIME OF CONCENTRATION(MIN.)=   21.02  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.336; Fm =  0.084 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |      PEAK FLOW RATE TABLE                                                |               | |
| |             |    Q(cfs)    Tc(min)  Fp(avg)   Ap(avg)   Fm(avg)   I(in/hr)  Ae(Acres)  NODE |               | |
| |             |    49.99     21.02     0.250     0.34     0.084      2.14     27.02      52.0|               | |
| |             |    47.42     32.74     0.250     0.42     0.104      1.67     33.76       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| *                                                                                                       * |
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| |                                                                                          | |
| |  Ripcurl Preliminary Hydrology Study Existing Conditions with Proposed Project: 50-year Storm Event  | |
| |                                                                                          | |
| |                                                                                          | |
| |-----------------------------------------[ORANGE COUNTY]-----------------------------------| |
| |  FILE NAME:PPE50.DAT                      *ENGLISH UNITS*             | CALCULATED BY:    | |
| |  TIME/DATE OF STUDY: 22:39   6/ 7/2008                                |    CHECKED BY:    | |
| |  50.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)               | PAGE NUMBER   1 OF| |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA | |
| |        10.00|    1.2|   1.2| C |Grass|----|  9.6|3.76|0.25|0.250|   3.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.4|Qest.=   5.6    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.47;D*V= 0.7 | |
| | FLOW TO PT.#|       |      |          | 2.1|     |    |    |     |      |    |     |    |FLOODWIDTH=20.0 | |
| |        20.00|    1.2|  2.44| C |Grass|----| 11.7|3.36|0.25|0.250|   6.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.6|Qest.=   9.0    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.56;D*V= 0.9 | |
| | FLOW TO PT.#|       |      |          | 2.7|     |    |    |     |      |    |     |    |FLOODWIDTH=24.2 | |
| |        30.00|    1.8|  4.23| C |Grass|----| 14.4|2.99|0.25|0.250|  10.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  14.3    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.65;D*V= 1.2 | |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.7|     |    |0.03|     |      |    |     |    |FLOODWIDTH=28.8 | |
| |        40.00|    2.8|  7.79| C |Grass|----| 18.1|2.62|0.25|0.229|  16.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  22.1    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3 | |
| | FLOW TO PT.#|    3.1|      | C | Com | 4.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4 | |
| |        50.00|    2.3| 13.14| C |Grass|----| 22.4|2.33|0.25|0.185|  25.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        50.00|       |  13.1|   |     |----| 22.4|2.33|    |     |  25.4|----|-----|----|FOR CONFLUENCE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 794|.0100| .. |INITIAL SUBAREA | |
| |        50.00|    3.8|   3.8| C | Com |----| 11.0|3.47|0.03|0.025|  11.9|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| | CONFLUENCE  |                 PEAK FLOW RATE =        33.3 (cfs)                   |                | |
| |  ANALYSIS   |                 TIME OF CONCENTRATION(MIN.) =   22.4                 |    LARGEST     | |
| |  FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr) |   CONFLUENCE   | |
| |        50.00|     EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =     16.95 (Acres)|   Q=      33.3 | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |   31.05     11.04    0.250     0.50    0.126       3.47    10.31     52.0|                | |
| |             |   33.28     22.35    0.250     0.60    0.149       2.33    16.95      0.0|                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  35.6    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3 | |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4 | |
| |        55.00|    1.9| 19.57| C | Com |----| 25.5|2.16|0.19|0.148|  35.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  39.8    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8 | |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4 | |
| |        60.00|    0.5| 17.68| C |Grass|----| 16.2|2.07|0.25|0.108|  42.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.1|Qest.=  52.9    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.80;D*V= 1.7 | |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.7|     |    |0.03|     |      |    |     |    |FLOODWIDTH=37.9 | |
| |        70.00|    0.6| 27.11| C |Grass|----| 20.8|2.42|0.25|0.084|  57.1|----|-----|----|----------------| |
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| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        70.00|       |  27.1|   |     |----| 20.8|    |    |     |  57.1|----|-----|----|STREAM SUMMARY  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| | EFFECTIVE AREA =      27.11 Acres  TOTAL AREA =     33.76 Acres  PEAK FLOW RATE =      57.10 cfs        | |
| | TIME OF CONCENTRATION(MIN.)=   20.83  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.337; Fm =  0.084 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |     PEAK FLOW RATE TABLE                                               |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |   57.10     20.83    0.250     0.34    0.084       2.42    27.11     52.0|                | |
| |             |   54.38     32.22    0.250     0.42    0.104       1.89    33.76      0.0|                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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| |                                                                                          | |
| |  Ripcurl Preliminary Hydrology Study Existing Conditions with Proposed Project: 100-year Storm Event | |
| |                                                                                          | |
| |                                                                                          | |
| |-----------------------------------------[ORANGE COUNTY]-----------------------------------| |
| |  FILE NAME:PPE100.DAT                     *ENGLISH UNITS*             | CALCULATED BY:    | |
| |  TIME/DATE OF STUDY: 22:39   6/ 7/2008                                |    CHECKED BY:    | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)               | PAGE NUMBER   1 OF| |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA | |
| |        10.00|    1.2|   1.2| C |Grass|----|  9.6|4.26|0.25|0.250|   4.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.5|Qest.=   6.3    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.50;D*V= 0.7 | |
| | FLOW TO PT.#|       |      |          | 2.0|     |    |    |     |      |    |     |    |FLOODWIDTH=21.1 | |
| |        20.00|    1.2|  2.44| C |Grass|----| 11.6|3.82|0.25|0.250|   7.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.6|Qest.=  10.4    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.58;D*V= 1.0 | |
| | FLOW TO PT.#|       |      |          | 2.6|     |    |    |     |      |    |     |    |FLOODWIDTH=25.5 | |
| |        30.00|    1.8|  4.23| C |Grass|----| 14.2|3.40|0.25|0.250|  12.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  16.4    | |
| | 64.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.68;D*V= 1.2 | |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.6|     |    |0.03|     |      |    |     |    |FLOODWIDTH=31.1 | |
| |        40.00|    2.8|  7.79| C |Grass|----| 17.9|2.98|0.25|0.229|  19.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  25.4    | |
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| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    3.1|      | C | Com | 4.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        50.00|    2.3| 13.14| C |Grass|----| 22.1|2.64|0.25|0.185|  29.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        50.00|       |  13.1|   |     |----| 22.1|2.64|    |     |  29.0|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 794|.0100| .. |INITIAL SUBAREA| |
| |        50.00|    3.8|   3.8| C | Com |----| 11.0|3.93|0.03|0.025|  13.4|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | CONFLUENCE  |              PEAK FLOW RATE =       38.0 (cfs)                            |               | |
| |  ANALYSIS   |              TIME OF CONCENTRATION(MIN.) =   22.1                         |    LARGEST    | |
| | FOR POINT#  |    MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.596; Fm =  0.149 (in/hr)      |   CONFLUENCE  | |
| |        50.00|    EFFECTIVE AREA =      16.95 (Acres);  TOTAL AREA =      16.95 (Acres)|   Q=      38.0| |
| |             |   Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   35.57      11.04    0.250     0.50    0.126      3.93     10.39     52.0|               | |
| |             |   38.05      22.07    0.250     0.60    0.149      2.64     16.95      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  40.8   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.4| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.8| |
| |        55.00|    1.9| 19.57| C | Com |----| 25.2|2.45|0.19|0.148|  40.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  45.4   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 17.76| C |Grass|----| 16.2|2.35|0.25|0.109|  48.8|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.2|Qest.=  60.3   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.84;D*V= 1.8| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.5|     |    |0.03|     |      |    |     |    |FLOODWIDTH=39.4| |
| |        70.00|    0.6| 27.19| C |Grass|----| 20.6|2.75|0.25|0.085|  65.2|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  27.2|   |     |----| 20.6|    |    |     |  65.2|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      27.19 Acres  TOTAL AREA =     33.76 Acres  PEAK FLOW RATE =      65.15 cfs      | |
| | TIME OF CONCENTRATION(MIN.)=   20.62  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.339; Fm =  0.085 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |    PEAK FLOW RATE TABLE                                                   |               | |
| |             |   Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   65.15      20.62    0.250     0.34    0.085      2.75     27.19     52.0|               | |
| |             |   62.07      31.70    0.250     0.42    0.104      2.15     33.76      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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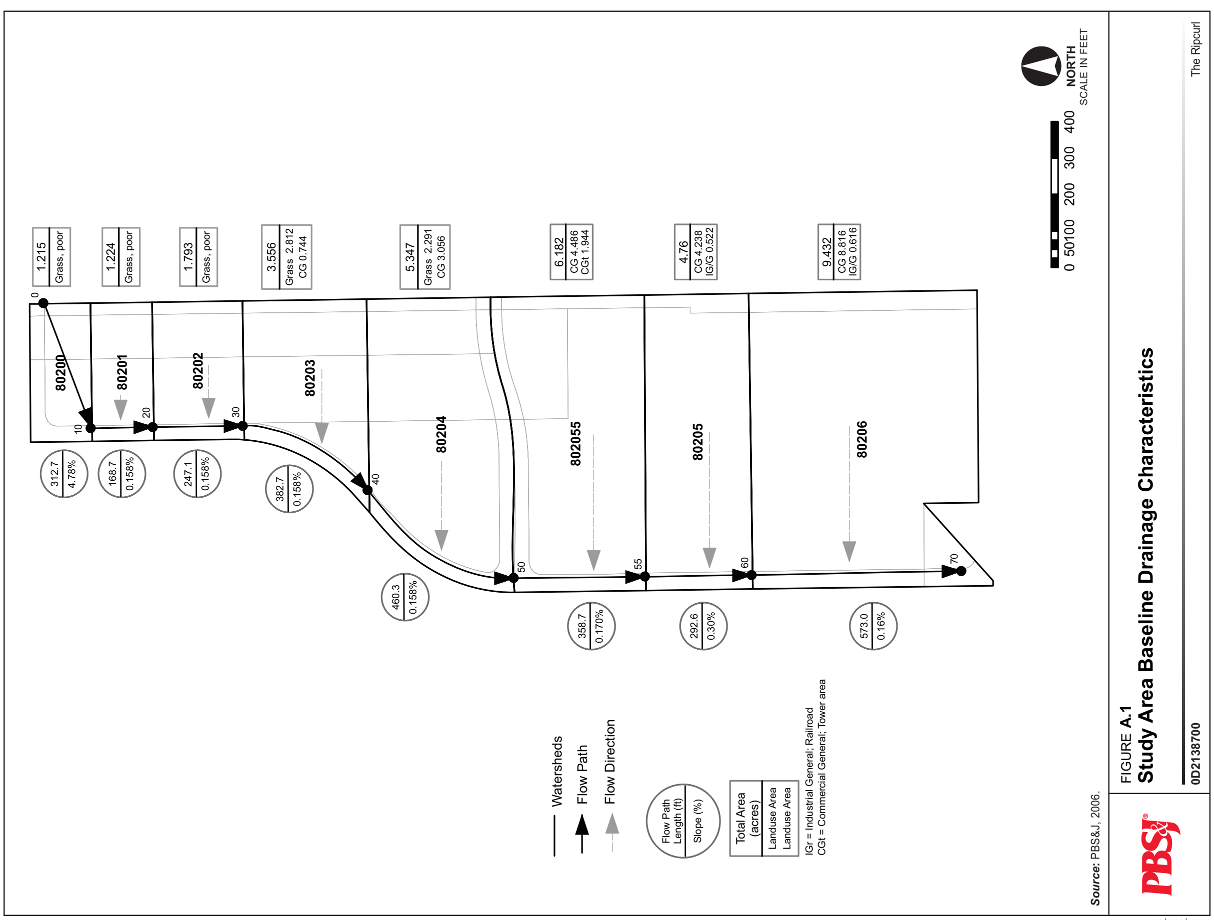


Source: PBS&J, 2006.

FIGURE A.1
Study Area Baseline Drainage Characteristics

0D2138700

The Ripcurl

Appendix B

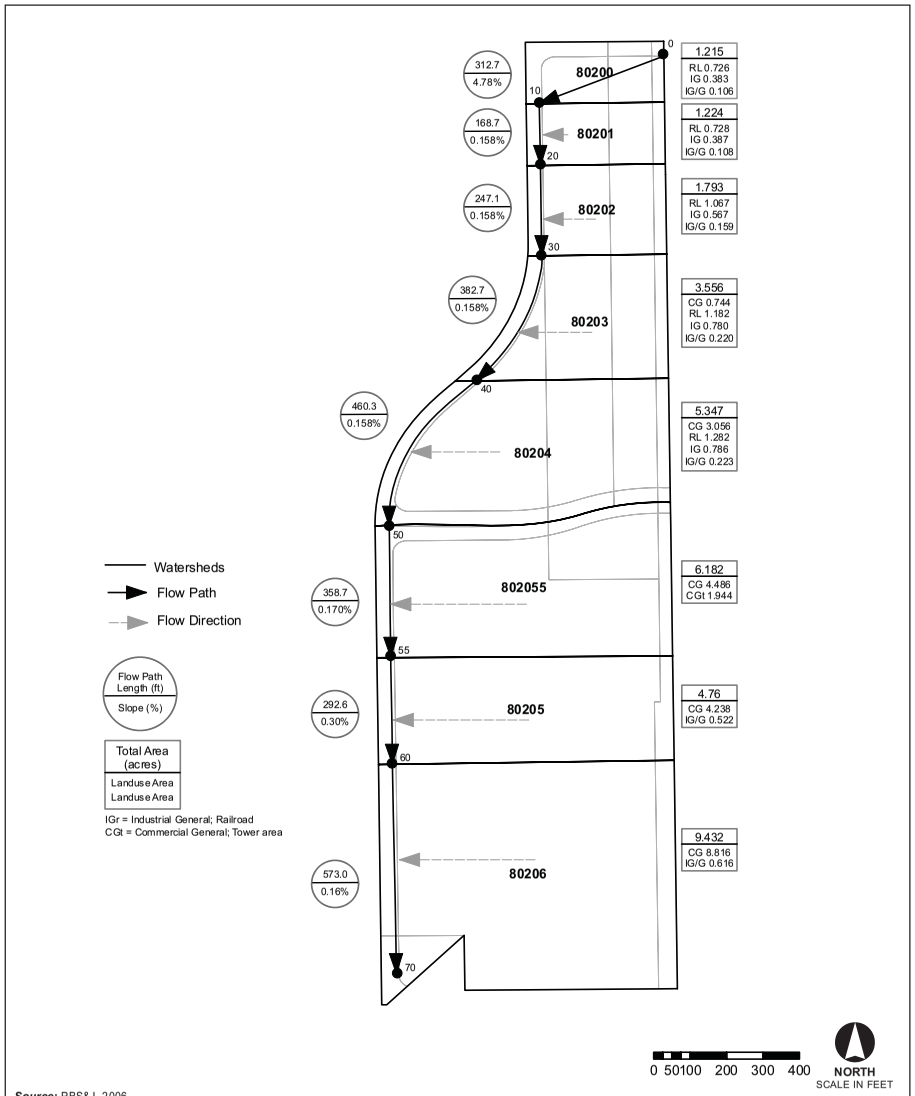
General Plan Build-Out Model

Example Model Schematic B

```
+#     0.00 ( 114.94)+
|  INITIAL  SUBAREA  |
|  LENGTH =  313. FT |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    0.11 AC |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    0.38 AC |
|....................|
|      5-7 DU/AC     |
|  SOIL GROUP  C     |
|  AREA =    0.73 AC |
+#    10.00 ( 100.00)+
          |
          V
+#    10.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  168.7 FT |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    0.11 AC |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    0.39 AC |
|....................|
|      5-7 DU/AC     |
|  SOIL GROUP  C     |
|  AREA =    0.73 AC |
+#    20.00 (  99.73)+
          |
          V
+#    20.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  247.1 FT |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    0.16 AC |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    0.57 AC |
|....................|
|      5-7 DU/AC     |
|  SOIL GROUP  C     |
|  AREA =    1.07 AC |
+#    30.00 (  99.61)+
          |
          V
+#    30.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  382.7 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    1.52 AC |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    0.22 AC |
|....................|
|      5-7 DU/AC     |
|  SOIL GROUP  C     |
|  AREA =    1.18 AC |
```

```
+#    40.00 (  99.40)+
          |
          V
+#    40.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  460.3 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    3.84 AC |
|....................|
|       GRASS        |  +#    52.00 ( 101.04)+
|  SOIL GROUP  C     |  |  INITIAL  SUBAREA  |
|  AREA =    0.22 AC |  |  LENGTH =  611. FT |
|....................|  |....................|
|      5-7 DU/AC     |  |     COMMERCIAL     |
|  SOIL GROUP  C     |  |  SOIL GROUP  C     |
|  AREA =    1.28 AC |  |  AREA =    3.82 AC |
+#    50.00 (  99.27)+  +#    50.00 ( 100.00)+
          |                       |
          V                       V
+----#     50.00 ----+  +----#     50.00 ----+
|     CONFLUENCE     |  |     CONFLUENCE     |
|      ANALYSIS      |<=|      ANALYSIS      |
|....................|  |....................|
|     STREAM #  1    |  |     STREAM #  2    |
+----#     50.00 ----+  +----#     50.00 ----+
=============================================>    CONFLUENCE    OF       2    STREAMS
<=============================================
          |
          V
+#    50.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  358.7 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    0.67 AC |
|....................|
|   USER-SPECIFIED   |
|  Fp =    0.25 IN/HR |
|  Ap = 0.75         |
|  AREA =    1.94 AC |
+#    55.00 (  99.39)+
          |
          V
+#    55.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  292.6 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    4.24 AC |
|....................|
|       GRASS        |
|  SOIL GROUP  C     |
|  AREA =    0.52 AC |
+#    60.00 (  99.12)+
          |
          V
+#    60.00 ( 100.00)+
| SYMMETRICAL STREET |
|  FLOW ON ONE SIDE  |
|....................|
| STREET SEC. 1 USED |
| LENGTH =  573.0 FT |
|....................|
|     COMMERCIAL     |
|  SOIL GROUP  C     |
|  AREA =    8.82 AC |
|....................|
|       GRASS        |
```

```
|  SOIL GROUP  C     |
|  AREA =    0.62 AC |
+#    70.00 (  99.08)+
          |
          V
+--------------------+
|   END OF RATIONAL  |
|    METHOD  STUDY   |
+--------------------+
```



Source: PBS&J, 2006.

PBS&J

FIGURE **B.1**

Study Area General Plan Buildout Drainage Characteristics

0D2138700

The Ripcurl

03002 | JCS | 08

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out:  10-year


 ---------------------------------------------------------------------------
   FILE NAME: BO10.DAT
   TIME/DATE OF STUDY: 22:45 06/07/2008
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
   *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.820
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    86    9.60
   COMMERCIAL                  C        0.38      0.25     0.100    69    5.56
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    69    7.11
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```



```
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA RUNOFF(CFS) =      4.06
   TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      4.06

****************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ---------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.76
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.48
     HALFSTREET FLOOD WIDTH(FEET) =   20.34
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.36
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
   STREET FLOW TRAVEL TIME(MIN.) =   2.07   Tc(MIN.) =    7.63
   *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.186
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    86
   COMMERCIAL                  C        0.39      0.25     0.100    69
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    69
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.39
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       6.76

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.51   HALFSTREET FLOOD WIDTH(FEET) =  21.59
   FLOW VELOCITY(FEET/SEC.) =  1.42   DEPTH*VELOCITY(FT*FT/SEC.) =   0.72
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ---------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.55
    HALFSTREET FLOOD WIDTH(FEET) =   23.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =   10.36
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.675
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    86
  COMMERCIAL                 C        0.57      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    4.15
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =       9.79

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.57   HALFSTREET FLOOD WIDTH(FEET) =  24.91
  FLOW VELOCITY(FEET/SEC.) =  1.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.89
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.62
    HALFSTREET FLOOD WIDTH(FEET) =   27.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
  STREET FLOW TRAVEL TIME(MIN.) =   3.87   Tc(MIN.) =   14.22
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.230
  SUBAREA LOSS RATE DATA(AMC  II):
```



```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    5.66
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      13.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.64   HALFSTREET FLOOD WIDTH(FEET) =  28.34
  FLOW VELOCITY(FEET/SEC.) =  1.69   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.23
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   33.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.80
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.27
  STREET FLOW TRAVEL TIME(MIN.) =   4.26   Tc(MIN.) =   18.49
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.919
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.28      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =    8.95
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      20.70

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
```

```
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   18.49
  RAINFALL INTENSITY(INCH/HR) =   1.92
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.70

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.236
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       3.82      0.25     0.100    69   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.60
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =      7.60

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   2.24
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.60

  ** CONFLUENCE DATA **
   STREAM        Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER      (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        20.70   18.49    1.919  0.25( 0.08) 0.32      12.5       0.00
      2         7.60   14.16    2.236  0.25( 0.03) 0.10       3.8      52.00
```



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

  ** PEAK FLOW RATE TABLE **
   STREAM        Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER      (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        26.19   14.16    2.236  0.25( 0.06) 0.26      13.4      52.00
      2        27.21   18.49    1.919  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.21    Tc(MIN.) =    18.49
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      29.10
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.56   SPLIT FLOOD WIDTH(FEET) =   24.28
    SPLIT FLOW(CFS) =    9.49   SPLIT VELOCITY(FEET/SEC.) =    1.58
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   21.66
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.753
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    69
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    3.77
  EFFECTIVE AREA(ACRES) =     18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      28.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
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  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

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  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      32.01
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.44   SPLIT FLOOD WIDTH(FEET) =   18.16
    SPLIT FLOW(CFS) =    5.96   SPLIT VELOCITY(FEET/SEC.) =    1.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   23.60
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.668
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    6.93
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      34.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.20
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   34.90
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.87
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   5.11   Tc(MIN.) =   28.72
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.491
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   12.32
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      42.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.74   HALFSTREET FLOOD WIDTH(FEET) =  35.51
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.40
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   18.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       42.85   24.37    1.638  0.25( 0.06) 0.24      30.2      52.00
      2       42.58   28.72    1.491  0.25( 0.06) 0.25      33.1       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      42.85  Tc(MIN.) =   24.37
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.24  EFFECTIVE AREA(ACRES) =      30.20
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       33.1  TC(MIN.) =     24.37
  EFFECTIVE AREA(ACRES) =     30.20  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.245
  PEAK FLOW RATE(CFS)    =      42.85

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       42.85   24.37    1.638  0.25( 0.06) 0.24      30.2      52.00
      2       42.58   28.72    1.491  0.25( 0.06) 0.25      33.1       0.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
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****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out:  25-year


 ---------------------------------------------------------------------------
   FILE NAME: BO25.DAT
   TIME/DATE OF STUDY: 22:45 06/07/2008
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   25.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.542
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    86    9.60
   COMMERCIAL                  C        0.38      0.25     0.100    69    5.56
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    69    7.11
```



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   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA RUNOFF(CFS) =      4.85
   TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      4.85

****************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ---------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.90
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.51
     HALFSTREET FLOOD WIDTH(FEET) =   21.78
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.42
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
   STREET FLOW TRAVEL TIME(MIN.) =   1.98   Tc(MIN.) =    7.54
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.824
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    86
   COMMERCIAL                  C        0.39      0.25     0.100    69
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    69
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    4.09
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
   TOTAL AREA(ACRES) =        2.4         PEAK FLOW RATE(CFS) =       8.16

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.54   HALFSTREET FLOOD WIDTH(FEET) =  23.22
   FLOW VELOCITY(FEET/SEC.) =  1.48   DEPTH*VELOCITY(FT*FT/SEC.) =   0.80
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ---------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
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  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.59
    HALFSTREET FLOOD WIDTH(FEET) =   25.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
  STREET FLOW TRAVEL TIME(MIN.) =   2.60   Tc(MIN.) =   10.14
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.233
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    86
  COMMERCIAL                 C        0.57      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    5.05
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      11.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.61   HALFSTREET FLOOD WIDTH(FEET) =  26.84
  FLOW VELOCITY(FEET/SEC.) =  1.63   DEPTH*VELOCITY(FT*FT/SEC.) =   1.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.38
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.67
    HALFSTREET FLOOD WIDTH(FEET) =   29.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.74
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
  STREET FLOW TRAVEL TIME(MIN.) =   3.68   Tc(MIN.) =   13.81
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.714
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  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    6.93
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      16.87

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.69   HALFSTREET FLOOD WIDTH(FEET) =  31.69
  FLOW VELOCITY(FEET/SEC.) =  1.77   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.34
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.41   SPLIT FLOOD WIDTH(FEET) =   16.59
    SPLIT FLOW(CFS) =    3.44   SPLIT VELOCITY(FEET/SEC.) =    1.20
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   18.03
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.334
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.28      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   10.95
```

```
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      25.37

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   18.03
  RAINFALL INTENSITY(INCH/HR) =   2.33
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      25.37

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.676
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                C        3.82      0.25      0.100    69   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.12
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =      9.12

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   2.68
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.12
```



```
  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.37   18.03    2.334  0.25( 0.08) 0.32      12.5       0.00
      2        9.12   14.16    2.676  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       32.06   14.16    2.676  0.25( 0.06) 0.26      13.6      52.00
      2       33.30   18.03    2.334  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.30    Tc(MIN.) =    18.03
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =      16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.63
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.67   SPLIT FLOOD WIDTH(FEET) =   29.69
    SPLIT FLOW(CFS) =   16.03   SPLIT VELOCITY(FEET/SEC.) =    1.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   21.21
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.129
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                C        0.67      0.25      0.100    69
  USER-DEFINED              -        1.94      0.25      0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    4.66
  EFFECTIVE AREA(ACRES) =     18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
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  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      34.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      39.19
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.57   SPLIT FLOOD WIDTH(FEET) =   24.66
    SPLIT FLOW(CFS) =   13.14   SPLIT VELOCITY(FEET/SEC.) =    2.13
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   23.15
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.026
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA       Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    8.47
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      41.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
```



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============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      49.23
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.77
    HALFSTREET FLOOD WIDTH(FEET) =   37.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.54
  STREET FLOW TRAVEL TIME(MIN.) =   4.77   Tc(MIN.) =   27.92
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.822
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA       Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   15.13
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      52.45

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.78   HALFSTREET FLOOD WIDTH(FEET) =  37.77
  FLOW VELOCITY(FEET/SEC.) =  2.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.60
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   22.6 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       52.64   24.05    1.983  0.25( 0.06) 0.25      30.4      52.00
      2       52.45   27.92    1.822  0.25( 0.06) 0.25      33.1       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      52.64  Tc(MIN.) =   24.05
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.25  EFFECTIVE AREA(ACRES) =      30.44
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       33.1  TC(MIN.) =     24.05
  EFFECTIVE AREA(ACRES) =     30.44  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.246
  PEAK FLOW RATE(CFS)   =      52.64

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
```

```
      1       52.64   24.05    1.983  0.25( 0.06) 0.25      30.4       52.00
      2       52.45   27.92    1.822  0.25( 0.06) 0.25      33.1        0.00
 ==============================================================================
 ==============================================================================
   END OF RATIONAL METHOD ANALYSIS

 ____________________________________________________________________________
 ******************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out:  50-year


 ------------------------------------------------------------------------------
   FILE NAME: BO50.DAT
   TIME/DATE OF STUDY: 22:46 06/07/2008
 ==============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ==============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   50.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ******************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ------------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ==============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
   *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  5.120
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```



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   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    86    9.60
   COMMERCIAL                  C        0.38      0.25     0.100    69    5.56
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    69    7.11
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA RUNOFF(CFS) =      5.48
   TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      5.48

 ******************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ------------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ==============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.81
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.53
     HALFSTREET FLOOD WIDTH(FEET) =   22.84
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.47
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
   STREET FLOW TRAVEL TIME(MIN.) =   1.92   Tc(MIN.) =    7.48
   *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  4.330
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    86
   COMMERCIAL                  C        0.39      0.25     0.100    69
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    69
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    4.65
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       9.27

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.56   HALFSTREET FLOOD WIDTH(FEET) =  24.41
   FLOW VELOCITY(FEET/SEC.) =  1.53   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

 ******************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ------------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ==============================================================================
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  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.15
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.62
    HALFSTREET FLOOD WIDTH(FEET) =   27.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   2.52   Tc(MIN.) =   10.00
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.673
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    86
  COMMERCIAL                 C        0.57      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    5.76
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      13.59

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.64   HALFSTREET FLOOD WIDTH(FEET) =  28.22
  FLOW VELOCITY(FEET/SEC.) =  1.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.55
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.70
```



```
    HALFSTREET FLOOD WIDTH(FEET) =   32.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.79
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.25
  STREET FLOW TRAVEL TIME(MIN.) =   3.56   Tc(MIN.) =   13.56
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.092
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    7.92
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      19.30

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.54
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.50   SPLIT FLOOD WIDTH(FEET) =   21.47
    SPLIT FLOW(CFS) =    6.64   SPLIT VELOCITY(FEET/SEC.) =    1.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   17.78
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.652
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
```

```
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C         1.28      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   12.48
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      28.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   17.78
  RAINFALL INTENSITY(INCH/HR) =   2.65
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.95

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.017
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                C        3.82      0.25     0.100    69   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.29
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     10.29

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   3.02
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
```



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  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.29

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       28.95   17.78    2.652  0.25( 0.08) 0.32      12.5       0.00
      2       10.29   14.16    3.017  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       36.61   14.16    3.017  0.25( 0.06) 0.26      13.8      52.00
      2       37.98   17.78    2.652  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      37.98    Tc(MIN.) =    17.78
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.65
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   34.72
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   3.13   Tc(MIN.) =   20.91
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                C        0.67      0.25     0.100    69
  USER-DEFINED              -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    5.34
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  EFFECTIVE AREA(ACRES) =     18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      39.90

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.53
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      44.73
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.64   SPLIT FLOOD WIDTH(FEET) =   28.22
    SPLIT FLOW(CFS) =   18.68   SPLIT VELOCITY(FEET/SEC.) =    2.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   22.86
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.300
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    9.64
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      47.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```



```
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      56.16
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.80
    HALFSTREET FLOOD WIDTH(FEET) =   38.56
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.67
  STREET FLOW TRAVEL TIME(MIN.) =   4.57   Tc(MIN.) =   27.43
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.075
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   17.28
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      59.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.81   HALFSTREET FLOOD WIDTH(FEET) =  39.35
  FLOW VELOCITY(FEET/SEC.) =  2.13   DEPTH*VELOCITY(FT*FT/SEC.) =   1.73
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   25.5 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       60.11   23.85    2.246  0.25( 0.06) 0.25      30.6      52.00
      2       59.98   27.43    2.075  0.25( 0.06) 0.25      33.1       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      60.11  Tc(MIN.) =   23.85
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.25  EFFECTIVE AREA(ACRES) =      30.58
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.1  TC(MIN.) =     23.85
  EFFECTIVE AREA(ACRES) =     30.58  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.246
  PEAK FLOW RATE(CFS)   =      60.11

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
    NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
       1       60.11   23.85    2.246  0.25( 0.06) 0.25      30.6      52.00
       2       59.98   27.43    2.075  0.25( 0.06) 0.25      33.1       0.00
 ============================================================================
 ============================================================================
   END OF RATIONAL METHOD ANALYSIS


 ____________________________________________________________________________
 ****************************************************************************
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                              Analysis prepared by:
                             Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out:  100-year


 ----------------------------------------------------------------------------
   FILE NAME: BO100.DAT
   TIME/DATE OF STUDY: 22:46 06/07/2008
 ============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ============================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

   *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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =     5.560
   * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.822
   SUBAREA Tc AND LOSS RATE DATA(AMC III):
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```
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    97    9.60
   COMMERCIAL                  C        0.38      0.25     0.100    86    5.56
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    86    7.11
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA RUNOFF(CFS) =      6.25
   TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      6.25

 ****************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.91
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.55
     HALFSTREET FLOOD WIDTH(FEET) =   24.03
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.52
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
   STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =    7.41
   * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.937
   SUBAREA LOSS RATE DATA(AMC III):
    DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                     C        0.11      0.25     1.000    97
   COMMERCIAL                  C        0.39      0.25     0.100    86
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    86
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    5.32
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =      10.60

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.59   HALFSTREET FLOOD WIDTH(FEET) =  25.72
   FLOW VELOCITY(FEET/SEC.) =  1.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

 ****************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
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  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.91
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.64
    HALFSTREET FLOOD WIDTH(FEET) =   28.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    9.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.196
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    97
  COMMERCIAL                 C        0.57      0.25     0.100    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    6.60
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      15.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.67   HALFSTREET FLOOD WIDTH(FEET) =  29.82
  FLOW VELOCITY(FEET/SEC.) =  1.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.17
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

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  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.11
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    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.29   SPLIT FLOOD WIDTH(FEET) =   10.89
    SPLIT FLOW(CFS) =    1.21   SPLIT VELOCITY(FEET/SEC.) =    0.94
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   3.51   Tc(MIN.) =   13.36
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.524
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    97
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    9.06
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      22.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      29.18
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.58   SPLIT FLOOD WIDTH(FEET) =   25.41
    SPLIT FLOW(CFS) =   10.28   SPLIT VELOCITY(FEET/SEC.) =    1.57
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   17.58
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  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.011
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    97
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.28      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   14.21
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      32.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  460.3 FT WITH ELEVATION-DROP =   0.7 FT, IS   17.1 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     50.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   17.58
  RAINFALL INTENSITY(INCH/HR) =   3.01
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      32.98

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.70
  ELEVATION DATA: UPSTREAM(FEET) =    101.04  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.157
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.408
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    86   14.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     11.63
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     11.63

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
```



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----------------------------------------------------------------------------
  >>>>>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.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   3.41
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.63

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       32.98   17.58    3.011  0.25( 0.08) 0.32      12.5       0.00
      2       11.63   14.16    3.408  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       41.80   14.16    3.408  0.25( 0.06) 0.26      13.9      52.00
      2       43.25   17.58    3.011  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      43.25    Tc(MIN.) =    17.58
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      46.31
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.75
    HALFSTREET FLOOD WIDTH(FEET) =   36.06
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.49
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  STREET FLOW TRAVEL TIME(MIN.) =   2.99   Tc(MIN.) =   20.57
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.751
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.67      0.25     0.100    86
  USER-DEFINED                -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    6.12
  EFFECTIVE AREA(ACRES) =     18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      45.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.74   HALFSTREET FLOOD WIDTH(FEET) =  35.87
  FLOW VELOCITY(FEET/SEC.) =  1.99   DEPTH*VELOCITY(FT*FT/SEC.) =   1.48
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      51.05
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.70   SPLIT FLOOD WIDTH(FEET) =   33.44
    SPLIT FLOW(CFS) =   25.00   SPLIT VELOCITY(FEET/SEC.) =    2.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   22.52
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.612
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        4.24      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                     C        0.52      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =   10.98
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      54.17
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  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.78
  FLOW VELOCITY(FEET/SEC.) =  2.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.83
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      64.01
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.83
    HALFSTREET FLOOD WIDTH(FEET) =   40.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.80
  STREET FLOW TRAVEL TIME(MIN.) =   4.40   Tc(MIN.) =   26.92
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.358
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        8.82      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                     C        0.62      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   19.68
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      68.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.85   HALFSTREET FLOOD WIDTH(FEET) =  41.06
  FLOW VELOCITY(FEET/SEC.) =  2.22   DEPTH*VELOCITY(FT*FT/SEC.) =   1.88
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   28.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       68.70   23.51    2.548  0.25( 0.06) 0.25      30.7       52.00
      2       68.43   26.92    2.358  0.25( 0.06) 0.25      33.1        0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      68.70  Tc(MIN.) =   23.51
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.25  EFFECTIVE AREA(ACRES) =      30.69
```

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LONGEST FLOWPATH FROM NODE      0.00 TO NODE      70.00 =    2795.80 FEET.
==============================================================================
  END OF STUDY SUMMARY:          =      33.1  TC(MIN.) =       23.51
  TOTAL AREA(ACRES)              =     30.69  AREA-AVERAGED Fm(INCH/HR)=  0.06
  EFFECTIVE AREA(ACRES) =        =      0.25  AREA-AVERAGED Ap = 0.246
  AREA-AVERAGED Fp(INCH/HR) =    =     68.70
  PEAK FLOW RATE(CFS)     =

  ** PEAK FLOW RATE TABLE **
    STREAM        Q        TC    Intensity    Fp(Fm)        Ap      Ae     HEADWATER
    NUMBER      (CFS)   (MIN.)  (INCH/HR)  (INCH/HR)    (ACRES)   NODE      NODE
       1        68.70    23.51     2.548   0.25( 0.06) 0.25      30.7     52.00
       2        68.43    26.92     2.358   0.25( 0.06) 0.25      33.1      0.00
==============================================================================
END OF RATIONAL METHOD ANALYSIS
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Ripcurl Preliminary Hydrology Study General Plan Buildout: 10-year Storm Event

[ORANGE COUNTY]

FILE NAME:B010.DAT *ENGLISH UNITS* CALCULATED BY:
TIME/DATE OF STUDY: 22:42 6/ 7/2008 CHECKED BY:
10.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) PAGE NUMBER 1 OF

[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm (Avg)	Fm	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
					..						312	.0478	..	INITIAL SUBAREA
	0.1		C	Grass				0.25						
	0.4		C	Com				0.03						
10.00	0.7	1.2	C	6D/AC	----	5.6	3.82	0.12	0.104	4.1	168	.0016	1.4	Qest.= 5.8
64.ft-STREET	0.1		C	Grass				0.25						D=0.48;D*V= 0.7
FLOW TO PT.#	0.4		C	Com	2.1			0.03						FLOODWIDTH=20.3
20.00	0.7	2.44	C	6D/AC	----	7.6	3.19	0.12	0.104	6.8	247	.0016	1.6	Qest.= 8.8
64.ft-STREET	0.2		C	Grass				0.25						D=0.55;D*V= 0.9
FLOW TO PT.#	0.6		C	Com	2.7			0.03						FLOODWIDTH=24.0
30.00	1.1	4.23	C	6D/AC	----	10.4	2.67	0.12	0.104	9.8	382	.0016	1.7	Qest.= 12.6
64.ft-STREET	1.5		C	Com				0.03						D=0.62;D*V= 1.1
FLOW TO PT.#	0.2		C	Grass	3.9			0.25						FLOODWIDTH=27.5
40.00	1.2	7.16	C	6D/AC	----	14.2	2.23	0.12	0.095	13.7	460	.0016	1.8	Qest.= 18.2
64.ft-STREET	3.8		C	Com				0.03						D=0.71;D*V= 1.3
FLOW TO PT.#	0.2		C	Grass	4.3			0.25						FLOODWIDTH=33.6
50.00	1.3	12.50	C	6D/AC	----	18.5	1.92	0.12	0.080	20.7	----	-----	----	
50.00		12.5			----	18.5	1.92			20.7	----	-----	----	FOR CONFLUENCE
					..						610	.0017	..	INITIAL SUBAREA
50.00	3.8	3.8	C	Com	----	14.2	2.24	0.03	0.025	7.6	----	-----	----	

CONFLUENCE ANALYSIS FOR POINT# 50.00

PEAK FLOW RATE = 27.2 (cfs)
TIME OF CONCENTRATION(MIN.) = 18.5
MEAN VALUES: Fp = 0.250 (in/hr); Ap = 0.267; Fm = 0.067 (in/hr)
EFFECTIVE AREA = 16.32 (Acres); TOTAL AREA = 16.32 (Acres)

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(Acres)	NODE
26.19	14.16	0.250	0.26	0.064	2.24	13.40	52.0

LARGEST CONFLUENCE Q= 27.2

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| |            |  27.21     18.49    0.250     0.27    0.067       1.92      16.32       0.0|               | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  29.1   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       55.00|    1.9| 18.93| C | Com |----|  21.7|1.75|0.19|0.078|   28.5|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  32.0   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       60.00|    0.5| 23.69| C |Grass|----|  23.6|1.67|0.25|0.072|   34.0|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 1.9|Qest.=  40.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.74;D*V= 1.4| |
| | FLOW TO PT.#|    8.8|      | C | Com | 5.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.9| |
| |       70.00|    0.6| 30.20| C |Grass|----|  24.4|1.49|0.25|0.061|   42.8|----|-----|----|---------------| |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       70.00|       |  30.2|   |     |----|  24.4|    |    |     |   42.8|----|-----|----|STREAM SUMMARY | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      30.20 Acres  TOTAL AREA =      33.13 Acres  PEAK FLOW RATE =      42.85 cfs     | |
| | TIME OF CONCENTRATION(MIN.)=   24.37  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.245; Fm =  0.061 (in/hr)| |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |    PEAK FLOW RATE TABLE                                                  |               | |
| |            |  Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |            |  42.85      24.37    0.250     0.24    0.061       1.64      30.20     52.0|               | |
| |            |  42.58      28.72    0.250     0.25    0.063       1.49      33.13      0.0|               | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |         Ripcurl Preliminary Hydrology Study General Plan Buildout: 25-year Storm Event              | |
| |                                                                                                     | |
| |                                                                                                     | |
| |-------------------------------------------[ORANGE COUNTY]-------------------------------------------| |
| |  FILE NAME:BO25.DAT                           *ENGLISH UNITS*               | CALCULATED BY:         | |
| |  TIME/DATE OF STUDY: 22:45    6/ 7/2008                                     |    CHECKED BY:         | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                     | PAGE NUMBER   1 OF     | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]----------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS  | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.|(in/hr)|(Avg)|(cfs)|(ft)|ft/ft|FPS.|   AND NOTES   | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |            |    0.1|      | C |Grass|    |     |    |0.25|     |      |----|-----|----|---------------| |
| |            |    0.4|      | C | Com |    |     |    |0.03|     |      |----|-----|----|---------------| |
| |       10.00|    0.7|   1.2| C |6D/AC|----|   5.6|4.54|0.12|0.104|    4.9|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.5|Qest.=   6.9   | |
| | 64.ft-STREET|    0.1|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.51;D*V= 0.8| |
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| | FLOW TO PT.#|    0.4|      | C | Com | 2.0|     |    |0.03|     |      |    |     |    |FLOODWIDTH=21.8| |
| |       20.00|    0.7|  2.44| C |6D/AC|----|   7.5|3.82|0.12|0.104|    8.2|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.6|Qest.=  10.7   | |
| | 64.ft-STREET|    0.2|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.59;D*V= 1.0| |
| | FLOW TO PT.#|    0.6|      | C | Com | 2.6|     |    |0.03|     |      |    |     |    |FLOODWIDTH=25.8| |
| |       30.00|    1.1|  4.23| C |6D/AC|----|  10.1|3.23|0.12|0.104|   11.9|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  15.4   | |
| | 64.ft-STREET|    1.5|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.67;D*V= 1.2| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 3.7|     |    |0.25|     |      |    |     |    |FLOODWIDTH=29.6| |
| |       40.00|    1.2|  7.16| C |6D/AC|----|  13.8|2.71|0.12|0.095|   16.9|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  22.3   | |
| | 64.ft-STREET|    3.8|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 4.2|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       50.00|    1.3| 12.50| C |6D/AC|----|  18.0|2.33|0.12|0.080|   25.4|----|-----|----|---------------| |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       50.00|       |  12.5|   |     |----|  18.0|2.33|    |     |   25.4|----|-----|----|FOR CONFLUENCE | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |       |      |   |     | .. |     |    |    |     |      | 610|.0017| .. |INITIAL SUBAREA| |
| |       50.00|    3.8|   3.8| C | Com |----|  14.2|2.68|0.03|0.025|    9.1|----|-----|----|---------------| |
| |            |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE|                  PEAK FLOW RATE =       33.3 (cfs)                                |               | |
| |  ANALYSIS  |                    TIME OF CONCENTRATION(MIN.) =    18.0                          |    LARGEST    | |
| |  FOR POINT#|    MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)              |   CONFLUENCE  | |
| |       50.00|    EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)         |   Q=      33.3| |
| |            |  Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |            |  32.06      14.16    0.250     0.26    0.064       2.68      13.64     52.0|               | |
| |            |  33.30      18.03    0.250     0.27    0.067       2.33      16.32      0.0|               | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  35.6   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       55.00|    1.9| 18.93| C | Com |----|  21.2|2.13|0.19|0.078|   35.0|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  39.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       60.00|    0.5| 23.69| C |Grass|----|  23.2|2.03|0.25|0.072|   41.7|----|-----|----|---------------| |
| |------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.0|Qest.=  49.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.78;D*V= 1.6| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.8|     |    |0.03|     |      |    |     |    |FLOODWIDTH=37.0| |
| |       70.00|    0.6| 30.44| C |Grass|----|  24.0|1.82|0.25|0.061|   52.6|----|-----|----|---------------| |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       70.00|       |  30.4|   |     |----|  24.0|    |    |     |   52.6|----|-----|----|STREAM SUMMARY | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      30.44 Acres  TOTAL AREA =      33.13 Acres  PEAK FLOW RATE =      52.64 cfs     | |
| | TIME OF CONCENTRATION(MIN.)=   24.05  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.246; Fm =  0.061 (in/hr)| |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |            |    PEAK FLOW RATE TABLE                                                  |               | |
| |            |  Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |            |  52.64      24.05    0.250     0.25    0.061       1.98      30.44     52.0|               | |
| |            |  52.45      27.92    0.250     0.25    0.063       1.82      33.13      0.0|               | |
| |------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |         Ripcurl Preliminary Hydrology Study General Plan Buildout: 50-year Storm Event   | |
| |                                                                                          | |
| |                                                                                          | |
| |------------------------------------------[ORANGE COUNTY]---------------------------------| |
| |  FILE NAME:BO50.DAT                         *ENGLISH UNITS*         | CALCULATED BY:     | |
| |  TIME/DATE OF STUDY: 22:46   6/ 7/2008                              |    CHECKED BY:     | |
| |  50.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)             | PAGE NUMBER   1 OF | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]----------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc |  I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr)  |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA | |
| |             |    0.1|      | C |Grass|    |     |    |0.25|     |      |----|-----|----|----------------| |
| |             |    0.4|      | C | Com |    |     |    |0.03|     |      |----|-----|----|----------------| |
| |        10.00|    0.7|   1.2| C |6D/AC|----|  5.6|5.12|0.12|0.104|   5.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.5|Qest.=    7.8   | |
| | 64.ft-STREET|    0.1|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.53;D*V= 0.8 | |
| | FLOW TO PT.#|    0.4|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=22.8 | |
| |        20.00|    0.7|  2.44| C |6D/AC|----|  7.5|4.33|0.12|0.104|   9.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.7|Qest.=   12.2   | |
| | 64.ft-STREET|    0.2|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.62;D*V= 1.0 | |
| | FLOW TO PT.#|    0.6|      | C | Com | 2.5|     |    |0.03|     |      |    |     |    |FLOODWIDTH=27.1 | |
| |        30.00|    1.1|  4.23| C |6D/AC|----| 10.0|3.67|0.12|0.104|  13.6|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=   17.6   | |
| | 64.ft-STREET|    1.5|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.70;D*V= 1.3 | |
| | FLOW TO PT.#|    0.2|      | C |Grass| 3.6|     |    |0.25|     |      |    |     |    |FLOODWIDTH=32.6 | |
| |        40.00|    1.2|  7.16| C |6D/AC|----| 13.6|3.09|0.12|0.095|  19.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=   25.5   | |
| | 64.ft-STREET|    3.8|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3 | |
| | FLOW TO PT.#|    0.2|      | C |Grass| 4.2|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4 | |
| |        50.00|    1.3| 12.50| C |6D/AC|----| 17.8|2.65|0.12|0.080|  28.9|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        50.00|       |  12.5|   |     |----| 17.8|2.65|    |     |  28.9|----|-----|----|FOR CONFLUENCE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 610|.0017| .. |INITIAL SUBAREA | |
| |        50.00|    3.8|   3.8| C | Com |----| 14.2|3.02|0.03|0.025|  10.3|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |  CONFLUENCE |                PEAK FLOW RATE =       38.0 (cfs)                        |                | |
| |   ANALYSIS  |                TIME OF CONCENTRATION(MIN.) =   17.8                     |    LARGEST     | |
| |  FOR POINT# |    MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)     |   CONFLUENCE   | |
| |        50.00|    EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)|   Q=      38.0 | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
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| |             |   36.61     14.16    0.250     0.26    0.064       3.02     13.78     52.0|                | |
| |             |   37.98     17.78    0.250     0.27    0.067       2.65     16.32      0.0|                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=   40.6   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.4 | |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.7 | |
| |        55.00|    1.9| 18.93| C | Com |----| 20.9|2.42|0.19|0.078|  39.9|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=   44.7   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8 | |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4 | |
| |        60.00|    0.5| 23.69| C |Grass|----| 22.9|2.30|0.25|0.072|  47.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.1|Qest.=   56.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.81;D*V= 1.7 | |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.6|     |    |0.03|     |      |    |     |    |FLOODWIDTH=38.6 | |
| |        70.00|    0.6| 30.58| C |Grass|----| 23.8|2.07|0.25|0.061|  60.1|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        70.00|       |  30.6|   |     |----| 23.8|    |    |     |  60.1|----|-----|----|STREAM SUMMARY  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| | EFFECTIVE AREA =      30.58 Acres  TOTAL AREA =      33.13 Acres  PEAK FLOW RATE =      60.11 cfs     | |
| | TIME OF CONCENTRATION(MIN.)=   23.85  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.246; Fm =  0.061 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |     PEAK FLOW RATE TABLE                                                |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |   60.11     23.85    0.250     0.25    0.061       2.25     30.58     52.0|                | |
| |             |   59.98     27.43    0.250     0.25    0.063       2.07     33.13      0.0|                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |------------------------------------------------------------------------------------------| |
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| |                                                                                          | |
| |         Ripcurl Preliminary Hydrology Study General Plan Buildout: 100-year Storm Event  | |
| |                                                                                          | |
| |                                                                                          | |
| |------------------------------------------[ORANGE COUNTY]---------------------------------| |
| |  FILE NAME:BO100.DAT                        *ENGLISH UNITS*         | CALCULATED BY:     | |
| |  TIME/DATE OF STUDY: 22:46   6/ 7/2008                              |    CHECKED BY:     | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)             | PAGE NUMBER   1 OF | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]----------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc |  I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr)  |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA | |
| |             |    0.1|      | C |Grass|    |     |    |0.25|     |      |----|-----|----|----------------| |
| |             |    0.4|      | C | Com |    |     |    |0.03|     |      |----|-----|----|----------------| |
| |        10.00|    0.7|   1.2| C |6D/AC|----|  5.6|5.82|0.12|0.104|   6.3|----|-----|----|----------------| |
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| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.6|Qest.=   8.9   | |
| | 64.ft-STREET|   0.1 |      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.55;D*V= 0.9| |
| | FLOW TO PT.#|   0.4 |      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=24.0| |
| |       20.00|   0.7 | 2.44 | C |6D/AC|----|  7.4|4.94|0.12|0.104|  10.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.7|Qest.=  13.9   | |
| | 64.ft-STREET|   0.2 |      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.64;D*V= 1.1| |
| | FLOW TO PT.#|   0.6 |      | C | Com | 2.4|     |    |0.03|     |      |    |     |    |FLOODWIDTH=28.5| |
| |       30.00|   1.1 | 4.23 | C |6D/AC|----|  9.8|4.20|0.12|0.104|  15.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  20.1   | |
| | 64.ft-STREET|   1.5 |      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   0.2 |      | C |Grass| 3.5|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       40.00|   1.2 | 7.16 | C |6D/AC|----| 13.4|3.52|0.12|0.095|  22.1|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  29.2   | |
| | 64.ft-STREET|   3.8 |      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|   0.2 |      | C |Grass| 4.2|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       50.00|   1.3 |12.50 | C |6D/AC|----| 17.6|3.01|0.12|0.080|  33.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       50.00|       |12.5  |   |     |----| 17.6|3.01|    |     |  33.0|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |                                          ..                                 610|.0017| ..|INITIAL SUBAREA| |
| |       50.00|   3.8 |  3.8 | C | Com |----| 14.2|3.41|0.03|0.025|  11.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                   PEAK FLOW RATE =       43.2 (cfs)                                        | |
| |   ANALYSIS  |                   TIME OF CONCENTRATION(MIN.) =   17.6                                     | |
| |  FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)                      | |
| |       50.00|     EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)                  | |
| |             |  Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE                      | |
| |             | 41.80     14.16    0.250     0.26    0.065      3.41     13.89     52.0                        | |
| |             | 43.25     17.58    0.250     0.27    0.067      3.01     16.32      0.0                        | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 2.0|Qest.=  46.3   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.74;D*V= 1.5| |
| | FLOW TO PT.#|   0.7 |      | C | Com | 3.0|     |    |0.03|     |      |    |     |    |FLOODWIDTH=36.1| |
| |       55.00|   1.9 |18.93 | C | Com |----| 20.6|2.75|0.19|0.078|  45.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  51.0   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.8| |
| | FLOW TO PT.#|   4.2 |      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |       60.00|   0.5 |23.69 | C |Grass|----| 22.5|2.61|0.25|0.072|  54.2|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.2|Qest.=  64.0   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.85;D*V= 1.9| |
| | FLOW TO PT.#|   8.8 |      | C | Com | 4.4|     |    |0.03|     |      |    |     |    |FLOODWIDTH=40.2| |
| |       70.00|   0.6 |30.69 | C |Grass|----| 23.5|2.36|0.25|0.062|  68.7|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |       70.00|       |30.7  |   |     |----| 23.5|    |    |     |  68.7|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      30.69 Acres  TOTAL AREA =     33.13 Acres  PEAK FLOW RATE =      68.70 cfs        | |
| | TIME OF CONCENTRATION(MIN.)=   23.51  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.246; Fm =  0.062 (in/hr)   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |     PEAK FLOW RATE TABLE                                                                      | |
| |             |  Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE                      | |
| |             | 68.70     23.51    0.250     0.25    0.062      2.55     30.69     52.0                        | |
| |             | 68.43     26.92    0.250     0.25    0.063      2.36     33.13      0.0                        | |
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| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2007 Advanced Engineering Software (aes)
              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out with Proposed Project:  10-year


 ---------------------------------------------------------------------------
   FILE NAME: BO25.DAT
   TIME/DATE OF STUDY: 22:45 06/07/2008
 ===========================================================================
   FILE NAME: PPBO10.DAT
   TIME/DATE OF STUDY: 22:49 06/07/2008
 ===========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   10.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ---------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
   *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.820
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                    C        0.11      0.25     1.000    86    9.60
   COMMERCIAL                 C        0.38      0.25     0.100    69    5.56
```



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   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"       C        0.73      0.25     0.500    69    7.11
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA RUNOFF(CFS) =      4.06
   TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      4.06

****************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ---------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.76
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.48
     HALFSTREET FLOOD WIDTH(FEET) =   20.34
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.36
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
   STREET FLOW TRAVEL TIME(MIN.) =   2.07   Tc(MIN.) =    7.63
   *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.186
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                    C        0.11      0.25     1.000    86
   COMMERCIAL                 C        0.39      0.25     0.100    69
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"       C        0.73      0.25     0.500    69
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    3.39
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       6.76

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.51   HALFSTREET FLOOD WIDTH(FEET) =  21.59
   FLOW VELOCITY(FEET/SEC.) =  1.42   DEPTH*VELOCITY(FT*FT/SEC.) =   0.72
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ---------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.55
    HALFSTREET FLOOD WIDTH(FEET) =   23.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =     1.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =   10.36
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.675
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    86
  COMMERCIAL                 C        0.57      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    4.15
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =       9.79

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.57   HALFSTREET FLOOD WIDTH(FEET) =  24.91
  FLOW VELOCITY(FEET/SEC.) =  1.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.89
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.62
    HALFSTREET FLOOD WIDTH(FEET) =   27.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =     1.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
```



```
  STREET FLOW TRAVEL TIME(MIN.) =   3.87   Tc(MIN.) =   14.22
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.230
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    5.66
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      13.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.64   HALFSTREET FLOOD WIDTH(FEET) =  28.34
  FLOW VELOCITY(FEET/SEC.) =  1.69   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.23
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   33.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =     1.80
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.27
  STREET FLOW TRAVEL TIME(MIN.) =   4.26   Tc(MIN.) =   18.49
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.919
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.28      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =    8.95
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      20.70
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   18.49
  RAINFALL INTENSITY(INCH/HR) =   1.92
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.70

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.579
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  C        3.82      0.25     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      8.78
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =      8.78

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   2.58
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.78

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```



```
      1       20.70   18.49    1.919  0.25( 0.08) 0.32      12.5       0.00
      2        8.78   11.04    2.579  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       25.57   11.04    2.579  0.25( 0.06) 0.24      11.3      52.00
      2       27.21   18.49    1.919  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.21    Tc(MIN.) =    18.49
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      29.10
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.56   SPLIT FLOOD WIDTH(FEET) =   24.28
    SPLIT FLOW(CFS) =    9.49   SPLIT VELOCITY(FEET/SEC.) =    1.58
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   21.66
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.753
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.67      0.25     0.100    69
  USER-DEFINED                -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    3.77
  EFFECTIVE AREA(ACRES) =     18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      28.54
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      32.01
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.44   SPLIT FLOOD WIDTH(FEET) =   18.16
    SPLIT FLOW(CFS) =    5.96   SPLIT VELOCITY(FEET/SEC.) =    1.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   23.60
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.668
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    6.93
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      34.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
```



```
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.20
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   34.90
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.87
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   5.11   Tc(MIN.) =   28.72
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.491
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   12.32
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      42.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.74   HALFSTREET FLOOD WIDTH(FEET) =  35.51
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.40
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   18.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.27   21.25    1.772  0.25( 0.06) 0.24      28.1      52.00
      2       42.58   28.72    1.491  0.25( 0.06) 0.25      33.1       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      43.27  Tc(MIN.) =   21.25
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.24  EFFECTIVE AREA(ACRES) =      28.09
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.1  TC(MIN.) =     21.25
  EFFECTIVE AREA(ACRES) =     28.09  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.239
  PEAK FLOW RATE(CFS)   =      43.27

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       43.27   21.25    1.772  0.25( 0.06) 0.24      28.1      52.00
      2       42.58   28.72    1.491  0.25( 0.06) 0.25      33.1       0.00
============================================================================
```

```
 ==============================================================================
   END OF RATIONAL METHOD ANALYSIS


 ******************************************************************************
                 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
                (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                              Analysis prepared by:
                            Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out with Proposed Project:  25-year


 ------------------------------------------------------------------------------
   FILE NAME: PPBO25.DAT
   TIME/DATE OF STUDY: 22:50 06/07/2008
 ==============================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ==============================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =   25.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ******************************************************************************
   FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ------------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ==============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
   ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
   SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.542
   SUBAREA Tc AND LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
   NATURAL POOR COVER
   "GRASS"                    C        0.11      0.25     1.000    86    9.60
```



```
   COMMERCIAL                 C        0.38      0.25     0.100    69    5.56
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"       C        0.73      0.25     0.500    69    7.11
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA RUNOFF(CFS) =      4.85
   TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      4.85

 ******************************************************************************
   FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ------------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ==============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
   STREET HALFWIDTH(FEET) = 32.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
   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 =   0.0300

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.90
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.51
     HALFSTREET FLOOD WIDTH(FEET) =   21.78
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.42
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
   STREET FLOW TRAVEL TIME(MIN.) =   1.98   Tc(MIN.) =    7.54
   *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.824
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
   NATURAL POOR COVER
   "GRASS"                    C        0.11      0.25     1.000    86
   COMMERCIAL                 C        0.39      0.25     0.100    69
   RESIDENTIAL
   "5-7 DWELLINGS/ACRE"       C        0.73      0.25     0.500    69
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
   SUBAREA AREA(ACRES) =     1.22     SUBAREA RUNOFF(CFS) =    4.09
   EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
   AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
   TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       8.16

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.54   HALFSTREET FLOOD WIDTH(FEET) =  23.22
   FLOW VELOCITY(FEET/SEC.) =  1.48   DEPTH*VELOCITY(FT*FT/SEC.) =   0.80
   LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

 ******************************************************************************
   FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
 ------------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ==============================================================================
   REPRESENTATIVE SLOPE =  0.0016
   STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
```

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  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.69
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.59
    HALFSTREET FLOOD WIDTH(FEET) =   25.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.58
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
  STREET FLOW TRAVEL TIME(MIN.) =   2.60   Tc(MIN.) =   10.14
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.233
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    86
  COMMERCIAL                 C        0.57      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    5.05
  EFFECTIVE AREA(ACRES) =       4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      11.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.61   HALFSTREET FLOOD WIDTH(FEET) =  26.84
  FLOW VELOCITY(FEET/SEC.) =  1.63   DEPTH*VELOCITY(FT*FT/SEC.) =   1.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.38
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.67
    HALFSTREET FLOOD WIDTH(FEET) =   29.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.74
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    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
  STREET FLOW TRAVEL TIME(MIN.) =   3.68   Tc(MIN.) =   13.81
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.714
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    6.93
  EFFECTIVE AREA(ACRES) =       7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      16.87

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.69   HALFSTREET FLOOD WIDTH(FEET) =  31.69
  FLOW VELOCITY(FEET/SEC.) =  1.77   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.34
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.41   SPLIT FLOOD WIDTH(FEET) =   16.59
    SPLIT FLOW(CFS) =    3.44   SPLIT VELOCITY(FEET/SEC.) =    1.20
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   18.03
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.334
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.28      0.25     0.500    69
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   10.95
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      25.37

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   18.03
  RAINFALL INTENSITY(INCH/HR) =   2.33
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      25.37

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.081
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.51
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     10.51

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.08
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
```



```
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.51

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       25.37   18.03    2.334  0.25( 0.08) 0.32      12.5       0.00
      2       10.51   11.04    3.081  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       31.18   11.04    3.081  0.25( 0.06) 0.25      11.5      52.00
      2       33.30   18.03    2.334  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.30    Tc(MIN.) =    18.03
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.63
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.88
    SPLIT DEPTH(FEET) =    0.67   SPLIT FLOOD WIDTH(FEET) =   29.69
    SPLIT FLOW(CFS) =   16.03   SPLIT VELOCITY(FEET/SEC.) =    1.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  STREET FLOW TRAVEL TIME(MIN.) =   3.17   Tc(MIN.) =   21.21
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.129
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    69
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    4.66
  EFFECTIVE AREA(ACRES) =     18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      34.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.88   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      39.19
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.57   SPLIT FLOOD WIDTH(FEET) =   24.66
    SPLIT FLOW(CFS) =   13.14   SPLIT VELOCITY(FEET/SEC.) =    2.13
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   23.15
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.026
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    8.47
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      41.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
```



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----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      49.23
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.77
    HALFSTREET FLOOD WIDTH(FEET) =   37.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.54
  STREET FLOW TRAVEL TIME(MIN.) =   4.77   Tc(MIN.) =   27.92
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.822
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   15.13
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      52.45

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.78   HALFSTREET FLOOD WIDTH(FEET) =  37.77
  FLOW VELOCITY(FEET/SEC.) =  2.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.60
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   22.6 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       53.08   20.92    2.146  0.25( 0.06) 0.24      28.3      52.00
      2       52.45   27.92    1.822  0.25( 0.06) 0.25      33.1       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      53.08  Tc(MIN.) =   20.92
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.24  EFFECTIVE AREA(ACRES) =      28.28
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.1  TC(MIN.) =     20.92
  EFFECTIVE AREA(ACRES) =     28.28  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.240
  PEAK FLOW RATE(CFS)   =      53.08
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```
  ** PEAK FLOW RATE TABLE **
   STREAM        Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1        53.08   20.92    2.146  0.25( 0.06) 0.24      28.3       52.00
      2        52.45   27.92    1.822  0.25( 0.06) 0.25      33.1        0.00
 ==============================================================================
 ==============================================================================
  END OF RATIONAL METHOD ANALYSIS


 ____________________________________________________________________________
 ******************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 14.3  Release Date: 09/09/2007  License ID 1217

                              Analysis prepared by:
                            Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out with Proposed Project:  50-year


 ----------------------------------------------------------------------------
  FILE NAME: PPBO50.DAT
  TIME/DATE OF STUDY: 22:51 06/07/2008
 ==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ==============================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   50.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ******************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
```



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  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  5.120
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                    C        0.11      0.25     1.000    86    9.60
  COMMERCIAL                 C        0.38      0.25     0.100    69    5.56
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        0.73      0.25     0.500    69    7.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA RUNOFF(CFS) =      5.48
  TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      5.48

 ******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ==============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.53
    HALFSTREET FLOOD WIDTH(FEET) =   22.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   1.92   Tc(MIN.) =    7.48
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  4.330
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.11      0.25     1.000    86
  COMMERCIAL                 C        0.39      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        0.73      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    4.65
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       9.27

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.56   HALFSTREET FLOOD WIDTH(FEET) =  24.41
  FLOW VELOCITY(FEET/SEC.) =  1.53   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.

 ******************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
```

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----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.15
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.62
    HALFSTREET FLOOD WIDTH(FEET) =   27.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   2.52   Tc(MIN.) =   10.00
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.673
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    86
  COMMERCIAL                 C        0.57      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    5.76
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      13.59

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.64   HALFSTREET FLOOD WIDTH(FEET) =  28.22
  FLOW VELOCITY(FEET/SEC.) =  1.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300
```



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    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.55
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.70
    HALFSTREET FLOOD WIDTH(FEET) =   32.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.79
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.25
  STREET FLOW TRAVEL TIME(MIN.) =   3.56   Tc(MIN.) =   13.56
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.092
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    7.92
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      19.30

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.54
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.50   SPLIT FLOOD WIDTH(FEET) =   21.47
    SPLIT FLOW(CFS) =    6.64   SPLIT VELOCITY(FEET/SEC.) =    1.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   17.78
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.652
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
      LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        3.84      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                     C        0.22      0.25     1.000    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        C        1.28      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   12.48
  EFFECTIVE AREA(ACRES) =      12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      28.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   17.78
  RAINFALL INTENSITY(INCH/HR) =   2.65
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.95

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  3.473
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  C        3.82      0.25     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     11.85
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     11.85

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.47
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.85

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       28.95   17.78    2.652  0.25( 0.08) 0.32      12.5       0.00
      2       11.85   11.04    3.473  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       35.56   11.04    3.473  0.25( 0.06) 0.25      11.6      52.00
      2       37.98   17.78    2.652  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      37.98    Tc(MIN.) =    17.78
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      40.65
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   34.72
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   3.13   Tc(MIN.) =   20.91
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.67      0.25     0.100    69
```

```
  USER-DEFINED                  -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    5.34
  EFFECTIVE AREA(ACRES) =      18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      39.90

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.53
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      44.73
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.64   SPLIT FLOOD WIDTH(FEET) =   28.22
    SPLIT FLOW(CFS) =   18.68   SPLIT VELOCITY(FEET/SEC.) =    2.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   22.86
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.300
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =    9.64
  EFFECTIVE AREA(ACRES) =      23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      47.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.
```



```
****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      56.16
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.80
    HALFSTREET FLOOD WIDTH(FEET) =   38.56
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.67
  STREET FLOW TRAVEL TIME(MIN.) =   4.57   Tc(MIN.) =   27.43
  *  50 YEAR RAINFALL INTENSITY(INCH/HR) =  2.075
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    69
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   17.28
  EFFECTIVE AREA(ACRES) =      33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      59.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.81   HALFSTREET FLOOD WIDTH(FEET) =  39.35
  FLOW VELOCITY(FEET/SEC.) =  2.13   DEPTH*VELOCITY(FT*FT/SEC.) =   1.73
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   25.5 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       60.59   20.72    2.432  0.25( 0.06) 0.24      28.4      52.00
      2       59.98   27.43    2.075  0.25( 0.06) 0.25      33.1       0.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =      60.59  Tc(MIN.) =   20.72
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.24  EFFECTIVE AREA(ACRES) =      28.39
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     70.00 =    2795.80 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       33.1  TC(MIN.) =     20.72
  EFFECTIVE AREA(ACRES) =      28.39  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.240
```

```
  PEAK FLOW RATE(CFS)   =      60.59

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
      1       60.59   20.72    2.432  0.25( 0.06) 0.24      28.4      52.00
      2       59.98   27.43    2.075  0.25( 0.06) 0.25      33.1       0.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS


____________________________________________________________________________
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:
                        Sabrina Cook, Ph.D  PBS&J

General Plan Build-Out with Proposed Project:  100-year


 ---------------------------------------------------------------------------
  FILE NAME: PPBO100.DAT
  TIME/DATE OF STUDY: 22:52 06/07/2008
 ===========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ===========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *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   32.0     16.0    0.020/0.020/0.020   0.67    2.00 0.0313 0.083 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE     10.00 IS CODE =  21
 ---------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ===========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   312.70
  ELEVATION DATA: UPSTREAM(FEET) =    114.94  DOWNSTREAM(FEET) =    100.00
```



```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.560
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.822
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap     SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "GRASS"                     C        0.11      0.25     1.000    97    9.60
  COMMERCIAL                  C        0.38      0.25     0.100    86    5.56
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    86    7.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA RUNOFF(CFS) =      6.25
  TOTAL AREA(ACRES) =      1.21   PEAK FLOW RATE(CFS) =      6.25

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  62
 ---------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ===========================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   168.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.91
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.55
    HALFSTREET FLOOD WIDTH(FEET) =   24.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.52
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =    7.41
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.937
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                     C        0.11      0.25     1.000    97
  COMMERCIAL                  C        0.39      0.25     0.100    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        C        0.73      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    5.32
  EFFECTIVE AREA(ACRES) =      2.44    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =      10.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.59   HALFSTREET FLOOD WIDTH(FEET) =  25.72
  FLOW VELOCITY(FEET/SEC.) =  1.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     20.00 =     481.40 FEET.
```

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****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   247.10   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.91
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.64
    HALFSTREET FLOOD WIDTH(FEET) =   28.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    9.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.196
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "GRASS"                    C        0.16      0.25     1.000    97
  COMMERCIAL                 C        0.57      0.25     0.100    86
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.07      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.418
  SUBAREA AREA(ACRES) =    1.79      SUBAREA RUNOFF(CFS) =    6.60
  EFFECTIVE AREA(ACRES) =      4.23    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.42
  TOTAL AREA(ACRES) =        4.2        PEAK FLOW RATE(CFS) =      15.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.67   HALFSTREET FLOOD WIDTH(FEET) =  29.82
  FLOW VELOCITY(FEET/SEC.) =  1.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.17
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     30.00 =     728.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   382.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.11
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.29   SPLIT FLOOD WIDTH(FEET) =   10.89
    SPLIT FLOW(CFS) =    1.21   SPLIT VELOCITY(FEET/SEC.) =    0.94
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   3.51   Tc(MIN.) =   13.36
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.524
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.52      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    97
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.18      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.329
  SUBAREA AREA(ACRES) =    2.93      SUBAREA RUNOFF(CFS) =    9.06
  EFFECTIVE AREA(ACRES) =      7.16    AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =        7.2        PEAK FLOW RATE(CFS) =      22.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     40.00 =    1111.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   460.30   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      29.18
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.82
    SPLIT DEPTH(FEET) =    0.58   SPLIT FLOOD WIDTH(FEET) =   25.41
    SPLIT FLOW(CFS) =   10.28   SPLIT VELOCITY(FEET/SEC.) =    1.57
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
```

```
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.30
  STREET FLOW TRAVEL TIME(MIN.) =   4.22   Tc(MIN.) =   17.58
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.011
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        3.84      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.22      0.25     1.000    97
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        1.28      0.25     0.500    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.233
  SUBAREA AREA(ACRES) =    5.35      SUBAREA RUNOFF(CFS) =   14.21
  EFFECTIVE AREA(ACRES) =     12.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       12.5        PEAK FLOW RATE(CFS) =      32.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.71   HALFSTREET FLOOD WIDTH(FEET) =  34.38
  FLOW VELOCITY(FEET/SEC.) =  1.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  460.3 FT WITH ELEVATION-DROP =   0.7 FT, IS   17.1 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     50.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   17.58
  RAINFALL INTENSITY(INCH/HR) =   3.01
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      12.50
  TOTAL STREAM AREA(ACRES) =      12.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      32.98

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   794.70
  ELEVATION DATA: UPSTREAM(FEET) =    107.95  DOWNSTREAM(FEET) =    100.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.039
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.930
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        3.82      0.25     0.100    86   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     13.43
```



```
  TOTAL AREA(ACRES) =      3.82   PEAK FLOW RATE(CFS) =     13.43

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   11.04
  RAINFALL INTENSITY(INCH/HR) =   3.93
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.82
  TOTAL STREAM AREA(ACRES) =       3.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.43

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       32.98   17.58    3.011  0.25( 0.08) 0.32      12.5       0.00
      2       13.43   11.04    3.930  0.25( 0.03) 0.10       3.8      52.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       40.64   11.04    3.930  0.25( 0.06) 0.25      11.7      52.00
      2       43.25   17.58    3.011  0.25( 0.07) 0.27      16.3       0.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      43.25    Tc(MIN.) =    17.58
  EFFECTIVE AREA(ACRES) =      16.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     50.00 =    1571.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     55.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0017
  STREET LENGTH(FEET) =   358.70   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      46.31
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
    STREET FLOW DEPTH(FEET) =  0.75
    HALFSTREET FLOOD WIDTH(FEET) =   36.06
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.49
  STREET FLOW TRAVEL TIME(MIN.) =   2.99   Tc(MIN.) =   20.57
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.751
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.67      0.25     0.100    86
  USER-DEFINED               -        1.94      0.25     0.750     -
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.584
  SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    6.12
  EFFECTIVE AREA(ACRES) =      18.93    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       18.9        PEAK FLOW RATE(CFS) =      45.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.74   HALFSTREET FLOOD WIDTH(FEET) =  35.87
  FLOW VELOCITY(FEET/SEC.) =  1.99   DEPTH*VELOCITY(FT*FT/SEC.) =   1.48
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     55.00 =    1930.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0030
  STREET LENGTH(FEET) =   292.60   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      51.05
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.71   FLOOD WIDTH(FEET) =   34.38
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.50
    SPLIT DEPTH(FEET) =    0.70   SPLIT FLOOD WIDTH(FEET) =   33.44
    SPLIT FLOW(CFS) =   25.00   SPLIT VELOCITY(FEET/SEC.) =    2.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.71
    HALFSTREET FLOOD WIDTH(FEET) =   34.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.79
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   22.52
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.612
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        4.24      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.52      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.199
```



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  SUBAREA AREA(ACRES) =    4.76      SUBAREA RUNOFF(CFS) =   10.98
  EFFECTIVE AREA(ACRES) =     23.69    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       23.7        PEAK FLOW RATE(CFS) =      54.17

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.72   HALFSTREET FLOOD WIDTH(FEET) =  34.78
  FLOW VELOCITY(FEET/SEC.) =  2.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.83
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     60.00 =    2222.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0016
  STREET LENGTH(FEET) =   573.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 32.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  16.00
  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 =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      64.01
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.83
    HALFSTREET FLOOD WIDTH(FEET) =   40.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.80
  STREET FLOW TRAVEL TIME(MIN.) =   4.40   Tc(MIN.) =   26.92
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.358
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        8.82      0.25     0.100    86
  NATURAL POOR COVER
  "GRASS"                    C        0.62      0.25     1.000    97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.159
  SUBAREA AREA(ACRES) =    9.43      SUBAREA RUNOFF(CFS) =   19.68
  EFFECTIVE AREA(ACRES) =     33.13    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       33.1        PEAK FLOW RATE(CFS) =      68.43

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.85   HALFSTREET FLOOD WIDTH(FEET) =  41.06
  FLOW VELOCITY(FEET/SEC.) =  2.22   DEPTH*VELOCITY(FT*FT/SEC.) =   1.88
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  573.0 FT WITH ELEVATION-DROP =   0.9 FT, IS   28.8 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     70.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       69.31   20.40    2.765  0.25( 0.06) 0.24      28.5      52.00
      2       68.43   26.92    2.358  0.25( 0.06) 0.25      33.1       0.00
```

```
      General Plan Buildout with Proposed Project Detailed Output.txt
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =        69.31  Tc(MIN.) =      20.40
  AREA-AVERAGED Fm(INCH/HR) =  0.06  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.24  EFFECTIVE AREA(ACRES) =      28.47
  LONGEST FLOWPATH FROM NODE        0.00 TO NODE      70.00 =    2795.80 FEET.
==============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)                =      33.1  TC(MIN.) =       20.40
   EFFECTIVE AREA(ACRES) =      28.47  AREA-AVERAGED Fm(INCH/HR)=  0.06
   AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap = 0.241
   PEAK FLOW RATE(CFS)       =    69.31
   ** PEAK FLOW RATE TABLE **
    STREAM        Q      Tc    Intensity   Fp(Fm)      Ap     Ae      HEADWATER
    NUMBER      (CFS)  (MIN.) (INCH/HR)  (INCH/HR)            (ACRES)    NODE
       1        69.31   20.40    2.765   0.25( 0.06) 0.24     28.5      52.00
       2        68.43   26.92    2.358   0.25( 0.06) 0.25     33.1       0.00
==============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

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Ripcurl Preliminary Hydrology Study General Plan Buildout wit Proposed Project: 10-year Storm Event

[ORANGE COUNTY]

FILE NAME:PPB010.DAT *ENGLISH UNITS* CALCULATED BY:
TIME/DATE OF STUDY: 22:49 6/ 7/2008 CHECKED BY:
10.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) PAGE NUMBER 1 OF

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CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
					..						312	.0478	..	INITIAL SUBAREA
	0.1		C	Grass				0.25						
	0.4		C	Com				0.03						
10.00	0.7	1.2	C	6D/AC	----	5.6	3.82	0.12	0.104	4.1	168	.0016	1.4	Qest.= 5.8
64.ft-STREET	0.1		C	Grass				0.25						D=0.48;D*V= 0.7
FLOW TO PT.#	0.4		C	Com	2.1			0.03						FLOODWIDTH=20.3
20.00	0.7	2.44	C	6D/AC	----	7.6	3.19	0.12	0.104	6.8	247	.0016	1.6	Qest.= 8.8
64.ft-STREET	0.2		C	Grass				0.25						D=0.55;D*V= 0.9
FLOW TO PT.#	0.6		C	Com	2.7			0.03						FLOODWIDTH=24.0
30.00	1.1	4.23	C	6D/AC	----	10.4	2.67	0.12	0.104	9.8	382	.0016	1.7	Qest.= 12.6
64.ft-STREET	1.5		C	Com				0.03						D=0.62;D*V= 1.1
FLOW TO PT.#	0.2		C	Grass	3.9			0.25						FLOODWIDTH=27.5
40.00	1.2	7.16	C	6D/AC	----	14.2	2.23	0.12	0.095	13.7	460	.0016	1.8	Qest.= 18.2
64.ft-STREET	3.8		C	Com				0.03						D=0.71;D*V= 1.3
FLOW TO PT.#	0.2		C	Grass	4.3			0.25						FLOODWIDTH=33.6
50.00	1.3	12.50	C	6D/AC	----	18.5	1.92	0.12	0.080	20.7				
50.00		12.5			----	18.5	1.92			20.7				FOR CONFLUENCE
					..						794	.0100	..	INITIAL SUBAREA
50.00	3.8	3.8	C	Com	----	11.0	2.58	0.03	0.025	8.8				

CONFLUENCE ANALYSIS FOR POINT# 50.00

PEAK FLOW RATE = 27.2 (cfs)
TIME OF CONCENTRATION(MIN.) = 18.5
MEAN VALUES: Fp = 0.250 (in/hr); Ap = 0.267; Fm = 0.067 (in/hr)
EFFECTIVE AREA = 16.32 (Acres); TOTAL AREA = 16.32 (Acres)

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(Acres)	NODE
25.57	11.04	0.250	0.24	0.061	2.58	11.29	52.0

LARGEST CONFLUENCE Q= 27.2

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| |             |  27.21     18.49    0.250     0.27     0.067       1.92     16.32       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  29.1   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        55.00|    1.9| 18.93| C | Com |----| 21.7|1.75|0.19|0.078|  28.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  32.0   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 23.69| C |Grass|----| 23.6|1.67|0.25|0.072|  34.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 1.9|Qest.=  40.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.74;D*V= 1.4| |
| | FLOW TO PT.#|    8.8|      | C | Com | 5.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.9| |
| |        70.00|    0.6| 28.09| C |Grass|----| 21.3|1.49|0.25|0.060|  43.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  28.1|   |     |----| 21.3|    |    |     |  43.3|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.09 Acres  TOTAL AREA =      33.13 Acres  PEAK FLOW RATE =      43.27 cfs     | |
| | TIME OF CONCENTRATION(MIN.)=   21.25  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.239; Fm =  0.060 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |     PEAK FLOW RATE TABLE                                                   |               | |
| |             |   Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   43.27      21.25    0.250     0.24     0.060       1.77     28.09      52.0|               | |
| |             |   42.58      28.72    0.250     0.25     0.063       1.49     33.13       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |  Ripcurl Preliminary Hydrology Study General Plan Buildout wit Proposed Project: 25-year Storm Event  | |
| |                                                                                                     | |
| |                                                                                                     | |
| |-------------------------------------------[ORANGE COUNTY]-------------------------------------------| |
| |  FILE NAME:PPBO25.DAT                     *ENGLISH UNITS*                  | CALCULATED BY:         | |
| |  TIME/DATE OF STUDY: 22:50   6/ 7/2008                                     |    CHECKED BY:         | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                    | PAGE NUMBER   1 OF     | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]---------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV. | Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS  | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE |MIN.| MIN.|(in/hr)|    |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |             |    0.1|      | C |Grass|    |     |    |0.25|     |      |----|-----|----|---------------| |
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| |             |    0.4|      | C | Com |    |     |    |0.03|     |      |----|-----|----|---------------| |
| |        10.00|    0.7|   1.2| C |6D/AC|----|  5.6|4.54|0.12|0.104|   4.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.5|Qest.=    6.9  | |
| | 64.ft-STREET|    0.1|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.51;D*V= 0.8| |
| | FLOW TO PT.#|    0.4|      | C | Com | 2.0|     |    |0.03|     |      |    |     |    |FLOODWIDTH=21.8| |
| |        20.00|    0.7|  2.44| C |6D/AC|----|  7.5|3.82|0.12|0.104|   8.2|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.6|Qest.=  10.7   | |
| | 64.ft-STREET|    0.2|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.59;D*V= 1.0| |
| | FLOW TO PT.#|    0.6|      | C | Com | 2.6|     |    |0.03|     |      |    |     |    |FLOODWIDTH=25.8| |
| |        30.00|    1.1|  4.23| C |6D/AC|----| 10.1|3.23|0.12|0.104|  11.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  15.4   | |
| | 64.ft-STREET|    1.5|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.67;D*V= 1.2| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 3.7|     |    |0.25|     |      |    |     |    |FLOODWIDTH=29.6| |
| |        40.00|    1.2|  7.16| C |6D/AC|----| 13.8|2.71|0.12|0.095|  16.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  22.3   | |
| | 64.ft-STREET|    3.8|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 4.2|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        50.00|    1.3| 12.50| C |6D/AC|----| 18.0|2.33|0.12|0.080|  25.4|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        50.00|       |  12.5|   |     |----| 18.0|2.33|    |     |  25.4|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 794|.0100| .. |INITIAL SUBAREA| |
| |        50.00|    3.8|   3.8| C | Com |----| 11.0|3.08|0.03|0.025|  10.5|----|-----|----|---------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | CONFLUENCE  |                   PEAK FLOW RATE =        33.3 (cfs)                       |               | |
| |  ANALYSIS   |                   TIME OF CONCENTRATION(MIN.) =   18.0                     |    LARGEST    | |
| |  FOR POINT# |      MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)     |   CONFLUENCE  | |
| |        50.00|      EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)|   Q=       33.3| |
| |             |   Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   31.18      11.04    0.250     0.25     0.061       3.08     11.47      52.0|               | |
| |             |   33.30      18.03    0.250     0.27     0.067       2.33     16.32       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  35.6   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        55.00|    1.9| 18.93| C | Com |----| 21.2|2.13|0.19|0.078|  35.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  39.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 23.69| C |Grass|----| 23.2|2.03|0.25|0.072|  41.7|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.0|Qest.=  49.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.78;D*V= 1.6| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.8|     |    |0.03|     |      |    |     |    |FLOODWIDTH=37.0| |
| |        70.00|    0.6| 28.28| C |Grass|----| 20.9|1.82|0.25|0.060|  53.1|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  28.3|   |     |----| 20.9|    |    |     |  53.1|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.28 Acres  TOTAL AREA =      33.13 Acres  PEAK FLOW RATE =      53.08 cfs     | |
| | TIME OF CONCENTRATION(MIN.)=   20.92  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.240; Fm =  0.060 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |     PEAK FLOW RATE TABLE                                                   |               | |
| |             |   Q(cfs)    Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
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| |             |  53.08     20.92    0.250     0.24    0.060      2.15     28.28      52.0|               | |
| |             |  52.45     27.92    0.250     0.25    0.063      1.82     33.13       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |   Ripcurl Preliminary Hydrology Study General Plan Buildout wit Proposed Project: 50-year Storm Event | |
| |                                                                                                     | |
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| |-------------------------------------------[ORANGE COUNTY]-------------------------------------------| |
| |  FILE NAME:PPBO50.DAT                       *ENGLISH UNITS*            | CALCULATED BY:             | |
| |  TIME/DATE OF STUDY: 22:51   6/ 7/2008                                 |    CHECKED BY:             | |
| |  50.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                | PAGE NUMBER   1 OF         | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]----------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc |  I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr)  |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |             |    0.1|      | C |Grass|    |     |    |0.25|     |      |----|-----|----|---------------| |
| |             |    0.4|      | C | Com |    |     |    |0.03|     |      |----|-----|----|---------------| |
| |        10.00|    0.7|   1.2| C |6D/AC|----|  5.6|5.12|0.12|0.104|   5.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.5|Qest.=   7.8   | |
| | 64.ft-STREET|    0.1|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.53;D*V= 0.8| |
| | FLOW TO PT.#|    0.4|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=22.8| |
| |        20.00|    0.7|  2.44| C |6D/AC|----|  7.5|4.33|0.12|0.104|   9.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.7|Qest.=  12.2   | |
| | 64.ft-STREET|    0.2|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.62;D*V= 1.0| |
| | FLOW TO PT.#|    0.6|      | C | Com | 2.5|     |    |0.03|     |      |    |     |    |FLOODWIDTH=27.1| |
| |        30.00|    1.1|  4.23| C |6D/AC|----| 10.0|3.67|0.12|0.104|  13.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=  17.6   | |
| | 64.ft-STREET|    1.5|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.70;D*V= 1.3| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 3.6|     |    |0.25|     |      |    |     |    |FLOODWIDTH=32.6| |
| |        40.00|    1.2|  7.16| C |6D/AC|----| 13.6|3.09|0.12|0.095|  19.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=  25.5   | |
| | 64.ft-STREET|    3.8|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 4.2|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        50.00|    1.3| 12.50| C |6D/AC|----| 17.8|2.65|0.12|0.080|  28.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        50.00|       |  12.5|   |     |----| 17.8|2.65|    |     |  28.9|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 794|.0100| .. |INITIAL SUBAREA| |
| |        50.00|    3.8|   3.8| C | Com |----| 11.0|3.47|0.03|0.025|  11.9|----|-----|----|---------------| |
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| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                PEAK FLOW RATE =       38.0 (cfs)                         |               | |
| |   ANALYSIS  |                TIME OF CONCENTRATION(MIN.) =   17.8                      |   LARGEST     | |
| |  FOR POINT# |      MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)   |  CONFLUENCE   | |
| |        50.00|      EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)|  Q=      38.0| |
| |             |  Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |  35.56     11.04    0.250     0.25    0.062      3.47     11.58      52.0|               | |
| |             |  37.98     17.78    0.250     0.27    0.067      2.65     16.32       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=  40.6   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.4| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.7| |
| |        55.00|    1.9| 18.93| C | Com |----| 20.9|2.42|0.19|0.078|  39.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=  44.7   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 23.69| C |Grass|----| 22.9|2.30|0.25|0.072|  47.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.1|Qest.=  56.2   | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.81;D*V= 1.7| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.6|     |    |0.03|     |      |    |     |    |FLOODWIDTH=38.6| |
| |        70.00|    0.6| 28.39| C |Grass|----| 20.7|2.07|0.25|0.060|  60.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  28.4|   |     |----| 20.7|    |    |     |  60.6|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.39 Acres  TOTAL AREA =      33.13 Acres  PEAK FLOW RATE =      60.59 cfs    | |
| | TIME OF CONCENTRATION(MIN.)=   20.72  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.240; Fm =  0.060 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |      PEAK FLOW RATE TABLE                                                |               | |
| |             |  Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |  60.59     20.72    0.250     0.24    0.060      2.43     28.39      52.0|               | |
| |             |  59.98     27.43    0.250     0.25    0.063      2.07     33.13       0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |                                                                                                     | |
| |   Ripcurl Preliminary Hydrology Study General Plan Buildout wit Proposed Project: 100-year Storm Event| |
| |                                                                                                     | |
| |                                                                                                     | |
| |-------------------------------------------[ORANGE COUNTY]-------------------------------------------| |
| |  FILE NAME:PPBO100.DAT                      *ENGLISH UNITS*            | CALCULATED BY:             | |
| |  TIME/DATE OF STUDY: 22:52   6/ 7/2008                                 |    CHECKED BY:             | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)                | PAGE NUMBER   1 OF         | |
```

```
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS   | |
| | POINT NUMBER|SUBAREA| SUM  |TYPE|TYPE|MIN.| MIN.| (in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 312|.0478| .. |INITIAL SUBAREA| |
| |             |    0.1|      | C |Grass|    |     |    |0.25|     |      |----|-----|----|---------------| |
| |             |    0.4|      | C | Com |    |     |    |0.03|     |      |----|-----|----|---------------| |
| |        10.00|    0.7|   1.2| C |6D/AC|----|  5.6|5.82|0.12|0.104|   6.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 168|.0016| 1.6|Qest.=    8.9  | |
| | 64.ft-STREET|    0.1|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.55;D*V= 0.9| |
| | FLOW TO PT.#|    0.4|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=24.0| |
| |        20.00|    0.7|  2.44| C |6D/AC|----|  7.4|4.94|0.12|0.104|  10.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 247|.0016| 1.7|Qest.=   13.9  | |
| | 64.ft-STREET|    0.2|      | C |Grass|    |     |    |0.25|     |      |    |     |    |D=0.64;D*V= 1.1| |
| | FLOW TO PT.#|    0.6|      | C | Com | 2.4|     |    |0.03|     |      |    |     |    |FLOODWIDTH=28.5| |
| |        30.00|    1.1|  4.23| C |6D/AC|----|  9.8|4.20|0.12|0.104|  15.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 382|.0016| 1.8|Qest.=   20.1  | |
| | 64.ft-STREET|    1.5|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 3.5|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        40.00|    1.2|  7.16| C |6D/AC|----| 13.4|3.52|0.12|0.095|  22.1|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 460|.0016| 1.8|Qest.=   29.2  | |
| | 64.ft-STREET|    3.8|      | C | Com |    |     |    |0.03|     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.2|      | C |Grass| 4.2|     |    |0.25|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        50.00|    1.3| 12.50| C |6D/AC|----| 17.6|3.01|0.12|0.080|  33.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        50.00|       |  12.5|   |     |----| 17.6|3.01|    |     |  33.0|----|-----|----|FOR CONFLUENCE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 794|.0100| .. |INITIAL SUBAREA| |
| |        50.00|    3.8|   3.8| C | Com |----| 11.0|3.93|0.03|0.025|  13.4|----|-----|----|---------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                  PEAK FLOW RATE =        43.2 (cfs)                       |               | |
| |   ANALYSIS  |                  TIME OF CONCENTRATION(MIN.) =   17.6                     |    LARGEST    | |
| |  FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)     |   CONFLUENCE  | |
| |        50.00|     EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)|   Q=      43.2| |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   40.64     11.04    0.250     0.25    0.062      3.93     11.67     52.0|               | |
| |             |   43.25     17.58    0.250     0.27    0.067      3.01     16.32      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 2.0|Qest.=   46.3  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.74;D*V= 1.5| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.0|     |    |0.03|     |      |    |     |    |FLOODWIDTH=36.1| |
| |        55.00|    1.9| 18.93| C | Com |----| 20.6|2.75|0.19|0.078|  45.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=   51.0  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.72;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 23.69| C |Grass|----| 22.5|2.61|0.25|0.072|  54.2|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 2.2|Qest.=   64.0  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.85;D*V= 1.9| |
| | FLOW TO PT.#|    8.8|      | C | Com | 4.4|     |    |0.03|     |      |    |     |    |FLOODWIDTH=40.2| |
| |        70.00|    0.6| 28.47| C |Grass|----| 20.4|2.36|0.25|0.060|  69.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |        70.00|       |  28.5|   |     |----| 20.4|    |    |     |  69.3|----|-----|----|STREAM SUMMARY | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.47 Acres  TOTAL AREA =     33.13 Acres  PEAK FLOW RATE =      69.31 cfs      | |
| | TIME OF CONCENTRATION(MIN.)=   20.40  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.241; Fm =  0.060 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |     PEAK FLOW RATE TABLE                                                   |               | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   69.31     20.40    0.250     0.24    0.060      2.76     28.47     52.0|               | |
| |             |   68.43     26.92    0.250     0.25    0.063      2.36     33.13      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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| |-------------------------------------------[ORANGE COUNTY]-------------------------------------------| |
| |  FILE NAME:PPBO10.DAT                     *ENGLISH UNITS*               | CALCULATED BY:            | |
| |  TIME/DATE OF STUDY: 22:49   6/ 7/2008                                  |    CHECKED BY:            | |
| |  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                 | PAGE NUMBER   2 OF        | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |  HYDRAULICS   | |
| | POINT NUMBER|SUBAREA| SUM  |TYPE|TYPE|MIN.| MIN.| (in/hr)|(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |  CONFLUENCE |                  PEAK FLOW RATE =        27.2 (cfs)                       |               | |
| |   ANALYSIS  |                  TIME OF CONCENTRATION(MIN.) =   18.5                     |    LARGEST    | |
| |  FOR POINT# |     MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.267; Fm =  0.067 (in/hr)     |   CONFLUENCE  | |
| |        50.00|     EFFECTIVE AREA =      16.32 (Acres);  TOTAL AREA =      16.32 (Acres)|   Q=      27.2| |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   25.57     11.04    0.250     0.24    0.061      2.58     11.29     52.0|               | |
| |             |   27.21     18.49    0.250     0.27    0.067      1.92     16.32      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 358|.0017| 1.9|Qest.=   29.1  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.3| |
| | FLOW TO PT.#|    0.7|      | C | Com | 3.2|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        55.00|    1.9| 18.93| C | Com |----| 21.7|1.75|0.19|0.078|  28.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 292|.0030| 2.5|Qest.=   32.0  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.71;D*V= 1.8| |
| | FLOW TO PT.#|    4.2|      | C | Com | 1.9|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.4| |
| |        60.00|    0.5| 23.69| C |Grass|----| 23.6|1.67|0.25|0.072|  34.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 573|.0016| 1.9|Qest.=   40.2  | |
| | 64.ft-STREET|       |      |   |     |    |     |    |    |     |      |    |     |    |D=0.74;D*V= 1.4| |
| | FLOW TO PT.#|    8.8|      | C | Com | 5.1|     |    |0.03|     |      |    |     |    |FLOODWIDTH=34.9| |
| |        70.00|    0.6| 28.09| C |Grass|----| 21.3|1.49|0.25|0.060|  43.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        70.00|       |  28.1|   |     |----| 21.3|    |    |     |  43.3|----|-----|----|STREAM SUMMARY | |
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| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| | EFFECTIVE AREA =      28.09 Acres  TOTAL AREA =     33.13 Acres  PEAK FLOW RATE =      43.27 cfs       | |
| | TIME OF CONCENTRATION(MIN.)=   21.25  MEAN VALUES: Fp =  0.250 (in/hr); Ap = 0.239; Fm =  0.060 (in/hr)| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |     PEAK FLOW RATE TABLE                                                                   | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   43.27     21.25    0.250     0.24    0.060      1.77     28.09     52.0|               | |
| |             |   42.58     28.72    0.250     0.25    0.063      1.49     33.13      0.0|               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
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Appendix C

Study Area Characteristic

Source: Orange County Hydrology Manual 1986.

FIGURE **C.1**

Hydrologic Classification of Soils, Orange County, California Plate A

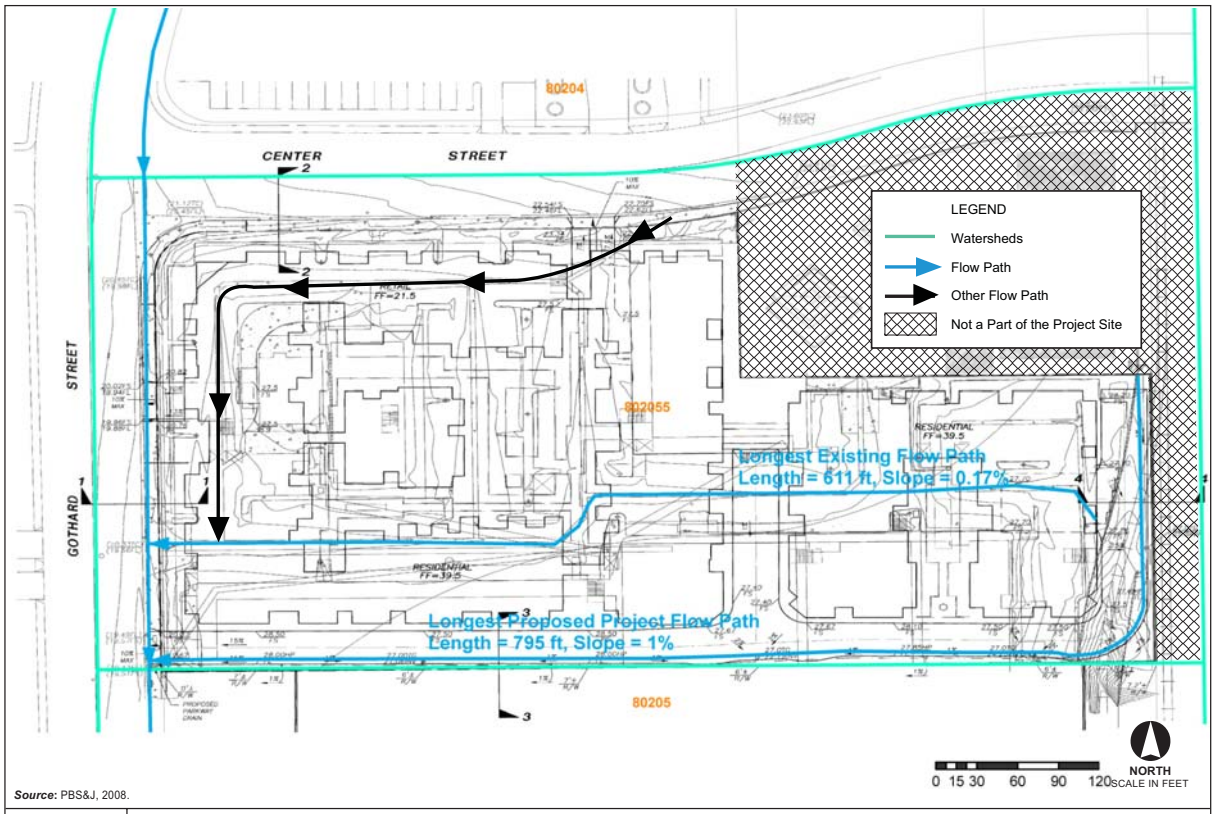
0D2138700 The Ripcurl

Source: PBS&J, 2006.

FIGURE **C.2**

Digital Elevation Model (DEM)

0D2138700 The Ripcurl

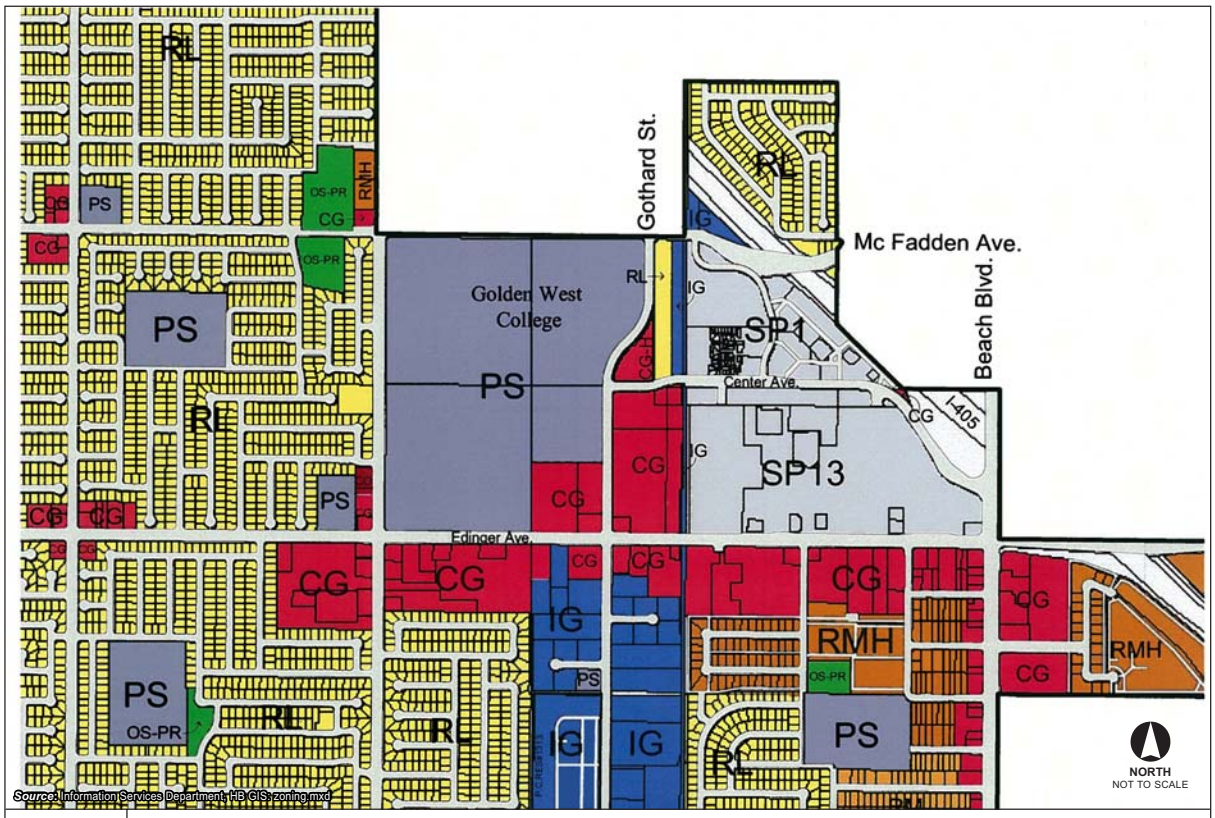


Source: PBS&J, 2008.

FIGURE **C.3**

Project Site Characteristics

0D2138700 The Ripcurl

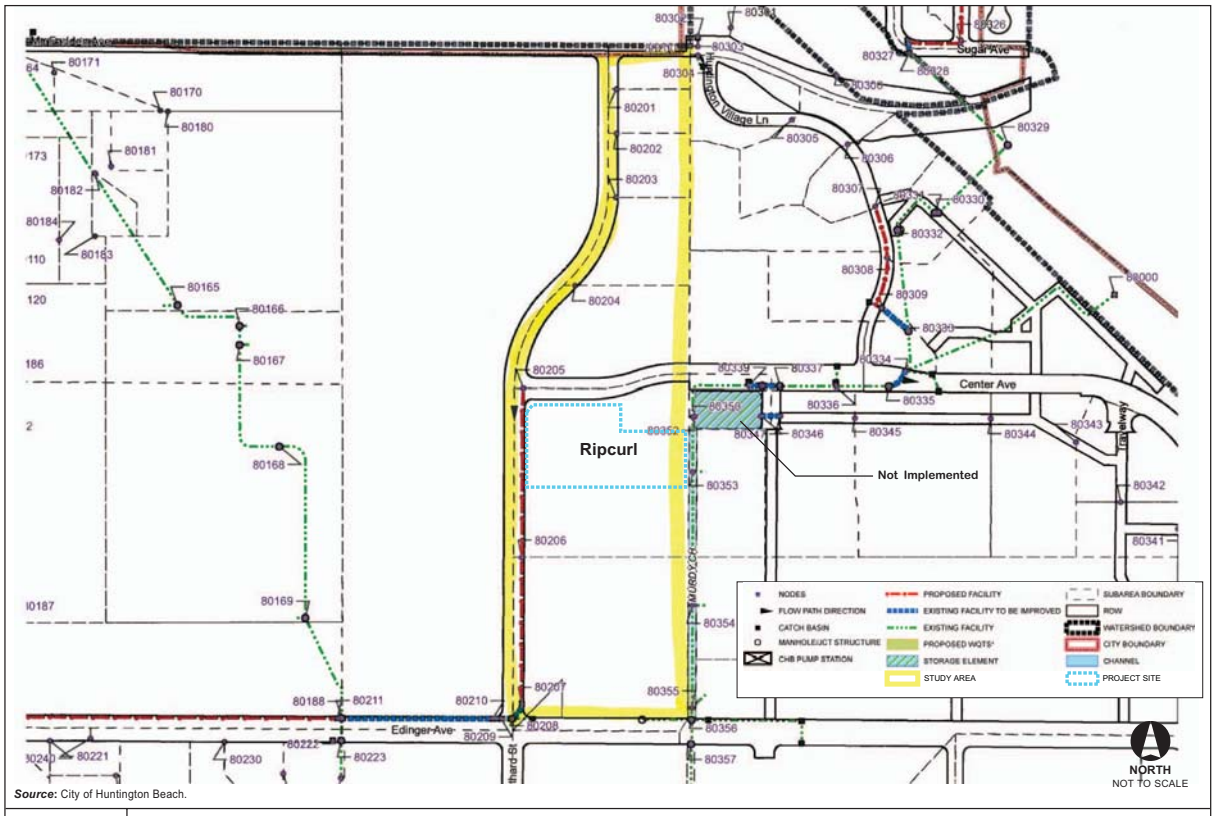


Source: Information Services Department, HB GIS, zoning.mxd

FIGURE **C.4**

Zoning City of Huntington Beach Version March 2006

0D2138700 The Ripcurl



Source: City of Huntington Beach.

FIGURE **C.5**

City of Huntington Beach Master Plan of Drainage Watershed No. 8A

0D2138700

The Ripcurl

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Table C.1: MPD Catchment Nodes and Study Area Model Nodes Comparison

Catchment	MPD Nodes Upstream	MPD Nodes Downstream	Study Area Model Upstream	Study Area Model Downstream
Initial Subarea				
80200	80200	80201	0	10
Streetflow				
80201	80201	80202	10	20
80202	80202	80203	20	30
80203	80203	80204	30	40
80204	80204	80205	40	50
80205	80205	80206	50	60
Initial Subarea Confluence				
802055			52	55
Streetflow				
802055			50	55
80205			55	60
80206	80206	80207	60	70

Project Site

Rest of 802055

Rest of 80205

PBS&J 2008

Appendix D

Street Flow Model

Sheet Flow Design Capacity

10-year; Nodes 10-50

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****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.001568
     CONSTANT STREET FLOW DEPTH(FEET) =    0.47
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.47
     HALFSTREET FLOOD WIDTH(FEET) =   20.04
     HALFSTREET FLOW(CFS) =    5.47
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.33
     PRODUCT OF DEPTH&VELOCITY =    0.63
 ============================================================================
```

25-year; Nodes 10-50

```
****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.001568
     CONSTANT STREET FLOW DEPTH(FEET) =    0.67
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.67
     HALFSTREET FLOOD WIDTH(FEET) =   29.79
     HALFSTREET FLOW(CFS) =   15.40
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.72
     PRODUCT OF DEPTH&VELOCITY =    1.15
 ============================================================================
```

10-year; Nodes 55-60

```
****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.003000
     CONSTANT STREET FLOW DEPTH(FEET) =    0.47
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.47
     HALFSTREET FLOOD WIDTH(FEET) =   20.04
     HALFSTREET FLOW(CFS) =    7.57
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.84
     PRODUCT OF DEPTH&VELOCITY =    0.87
 ============================================================================
```

10-year; Nodes 50-55

```
****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.001700
     CONSTANT STREET FLOW DEPTH(FEET) =    0.47
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.47
     HALFSTREET FLOOD WIDTH(FEET) =   20.04
     HALFSTREET FLOW(CFS) =    5.70
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.38
     PRODUCT OF DEPTH&VELOCITY =    0.66
 ============================================================================
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25-year; Nodes 50-55

```
****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.001700
     CONSTANT STREET FLOW DEPTH(FEET) =    0.67
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.67
     HALFSTREET FLOOD WIDTH(FEET) =   29.79
     HALFSTREET FLOW(CFS) =   16.04
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.79
     PRODUCT OF DEPTH&VELOCITY =    1.20
 ============================================================================
```

25-year; Nodes 55-60

```
 ****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.003000
     CONSTANT STREET FLOW DEPTH(FEET) =    0.67
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.67
     HALFSTREET FLOOD WIDTH(FEET) =   29.79
     HALFSTREET FLOW(CFS) =   21.31
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.37
     PRODUCT OF DEPTH&VELOCITY =    1.59
 ============================================================================
```

10-year; Nodes 60-70

```
 ****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.001600
     CONSTANT STREET FLOW DEPTH(FEET) =    0.47
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.47
     HALFSTREET FLOOD WIDTH(FEET) =   20.04
     HALFSTREET FLOW(CFS) =    5.53
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.34
     PRODUCT OF DEPTH&VELOCITY =    0.64
 ============================================================================
```

25-year; Nodes 60-70

```
 ****************************************************************************
 >>>>STREETFLOW MODEL INPUT INFORMATION<<<<
 ----------------------------------------------------------------------------
     CONSTANT STREET GRADE(FEET/FEET) = 0.001600
     CONSTANT STREET FLOW DEPTH(FEET) =    0.67
     AVERAGE STREETFLOW FRICTION FACTOR(MANNING) = 0.015000
     CONSTANT SYMMETRICAL STREET HALF-WIDTH(FEET) =   32.00
     DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   16.00
     INTERIOR STREET CROSSFALL(DECIMAL) = 0.020000
     OUTSIDE  STREET CROSSFALL(DECIMAL) = 0.020000
     CONSTANT SYMMETRICAL CURB HEIGHT(FEET) =   0.67
     CONSTANT SYMMETRICAL GUTTER-WIDTH(FEET) =   2.00
     CONSTANT SYMMETRICAL GUTTER-LIP(FEET) =  0.03125
     CONSTANT SYMMETRICAL GUTTER-HIKE(FEET) =  0.08300
     FLOW ASSUMED TO FILL STREET ON ONE SIDE.
 ============================================================================
     STREET FLOW MODEL RESULTS:
 ----------------------------------------------------------------------------
     STREET FLOW DEPTH(FEET) =  0.67
     HALFSTREET FLOOD WIDTH(FEET) =   29.79
     HALFSTREET FLOW(CFS) =   15.56
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.73
     PRODUCT OF DEPTH&VELOCITY =    1.16
 ============================================================================
```

Appendix E

Hydrographs

Proposed Project; Site Hydrograph

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 3.80
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.030
LOW LOSS FRACTION = 0.000
TIME OF CONCENTRATION(MIN.) = 11.00
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.34
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.72
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.95
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.59
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.20
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.68

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.04
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.12

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0. 2.5 5.0 7.5 10.0
0.05	0.0000	0.00	Q
0.23	0.0015	0.20	Q
0.42	0.0044	0.20	Q
0.60	0.0074	0.20	Q
0.78	0.0104	0.20	Q
0.97	0.0135	0.20	Q
1.15	0.0165	0.20	Q
1.33	0.0196	0.20	Q
1.52	0.0227	0.21	Q
1.70	0.0259	0.21	Q
1.88	0.0290	0.21	Q
2.07	0.0322	0.21	Q
2.25	0.0354	0.21	Q
2.43	0.0386	0.21	Q
2.62	0.0419	0.22	Q
2.80	0.0452	0.22	Q
2.98	0.0485	0.22	Q
3.17	0.0519	0.22	Q
3.35	0.0552	0.22	Q
3.53	0.0586	0.23	Q
3.72	0.0621	0.23	Q
3.90	0.0656	0.23	Q
4.08	0.0691	0.23	Q
4.27	0.0726	0.23	Q
4.45	0.0762	0.24	Q
4.63	0.0798	0.24	Q
4.82	0.0834	0.24	Q
5.00	0.0871	0.24	Q
5.18	0.0908	0.25	Q
5.37	0.0946	0.25	Q
5.55	0.0984	0.25	.Q
5.73	0.1022	0.25	.Q
5.92	0.1061	0.26	.Q
6.10	0.1100	0.26	.Q

6.28	0.1140	0.26	.Q
6.47	0.1180	0.27	.Q
6.65	0.1221	0.27	.Q
6.83	0.1262	0.27	.Q
7.02	0.1304	0.28	.Q
7.20	0.1346	0.28	.Q
7.38	0.1389	0.28	.Q
7.57	0.1432	0.29	.Q
7.75	0.1476	0.29	.Q
7.93	0.1520	0.30	.Q
8.12	0.1566	0.30	.Q
8.30	0.1611	0.30	.Q
8.48	0.1658	0.31	.Q
8.67	0.1705	0.31	.Q
8.85	0.1753	0.32	.Q
9.03	0.1802	0.32	.Q
9.22	0.1851	0.33	.Q
9.40	0.1901	0.33	.Q
9.58	0.1953	0.34	.Q
9.77	0.2005	0.35	.Q
9.95	0.2058	0.35	.Q
10.13	0.2112	0.36	.Q
10.32	0.2167	0.37	.Q
10.50	0.2223	0.37	.Q
10.68	0.2280	0.38	.Q
10.87	0.2339	0.39	.Q
11.05	0.2399	0.40	.Q
11.23	0.2460	0.41	.Q
11.42	0.2523	0.42	.Q
11.60	0.2587	0.43	.Q
11.78	0.2653	0.44	.Q
11.97	0.2720	0.45	.Q
12.15	0.2796	0.56	. Q
12.33	0.2884	0.60	. Q
12.52	0.2976	0.62	. Q
12.70	0.3071	0.63	. Q
12.88	0.3169	0.66	. Q
13.07	0.3270	0.67	. Q
13.25	0.3374	0.70	. Q
13.43	0.3481	0.72	. Q
13.62	0.3592	0.75	. Q
13.80	0.3708	0.77	. Q
13.98	0.3829	0.82	. Q
14.17	0.3955	0.85	. Q
14.35	0.4088	0.91	. Q
14.53	0.4228	0.94	. Q
14.72	0.4377	1.03	. Q
14.90	0.4536	1.08	. Q
15.08	0.4708	1.20	. Q
15.27	0.4897	1.29	. Q
15.45	0.5102	1.42	. Q
15.63	0.5320	1.46	. Q
15.82	0.5594	2.16	. Q
16.00	0.5983	2.97	.Q
16.18	0.6876	8.82	. Q
16.37	0.7674	1.70	. Q
16.55	0.7908	1.39	. Q
16.73	0.8099	1.13	. Q
16.92	0.8259	0.98	. Q
17.10	0.8400	0.87	. Q
17.28	0.8526	0.80	. Q
17.47	0.8642	0.73	. Q
17.65	0.8750	0.69	. Q

17.83	0.8850	0.64	. Q
18.02	0.8945	0.61	. Q
18.20	0.9026	0.46	.Q
18.38	0.9094	0.43	.Q
18.57	0.9158	0.41	.Q
18.75	0.9220	0.39	.Q
18.93	0.9278	0.38	.Q
19.12	0.9334	0.36	.Q
19.30	0.9388	0.35	.Q
19.48	0.9440	0.34	.Q
19.67	0.9491	0.33	.Q
19.85	0.9539	0.32	.Q
20.03	0.9587	0.31	.Q
20.22	0.9632	0.30	.Q
20.40	0.9677	0.29	.Q
20.58	0.9720	0.28	.Q
20.77	0.9763	0.28	.Q
20.95	0.9804	0.27	.Q
21.13	0.9844	0.26	.Q
21.32	0.9883	0.26	.Q
21.50	0.9922	0.25	.Q
21.68	0.9959	0.25	Q
21.87	0.9996	0.24	Q
22.05	1.0032	0.24	Q
22.23	1.0067	0.23	Q
22.42	1.0102	0.23	Q
22.60	1.0136	0.22	Q
22.78	1.0170	0.22	Q
22.97	1.0203	0.22	Q
23.15	1.0235	0.21	Q
23.33	1.0267	0.21	Q
23.52	1.0298	0.21	Q
23.70	1.0329	0.20	Q
23.88	1.0359	0.20	Q
24.07	1.0389	0.20	Q
24.25	1.0404	0.00	Q

WHOLE HYDROGRAPH MITIGATION

Existing Watershed

```
     RATIONAL METHOD CALIBRATION COEFFICIENT = 0.80
     TOTAL CATCHMENT AREA(ACRES) =    3.80
     SOIL-LOSS RATE, Fm,(INCH/HR) =  0.030
     LOW LOSS FRACTION = 0.000
     TIME OF CONCENTRATION(MIN.) = 11.04
     SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
     ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
     RETURN FREQUENCY(YEARS) =   2
        5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
       30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
        1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
        3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
        6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
       24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05
```



```
     TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.52
     TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.13
```

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0. 2.5 5.0 7.5 10.0
0.18	0.0007	0.10	Q
0.36	0.0022	0.10	Q
0.54	0.0037	0.10	Q
0.73	0.0052	0.10	Q
0.91	0.0067	0.10	Q
1.10	0.0083	0.10	Q
1.28	0.0098	0.10	Q
1.46	0.0114	0.10	Q
1.65	0.0129	0.10	Q
1.83	0.0145	0.10	Q
2.02	0.0161	0.10	Q
2.20	0.0177	0.11	Q
2.38	0.0193	0.11	Q
2.57	0.0210	0.11	Q
2.75	0.0226	0.11	Q
2.94	0.0243	0.11	Q
3.12	0.0259	0.11	Q
3.30	0.0276	0.11	Q
3.49	0.0293	0.11	Q
3.67	0.0310	0.11	Q
3.86	0.0328	0.11	Q
4.04	0.0345	0.12	Q
4.22	0.0363	0.12	Q
4.41	0.0381	0.12	Q
4.59	0.0399	0.12	Q
4.78	0.0417	0.12	Q
4.96	0.0435	0.12	Q
5.14	0.0454	0.12	Q
5.33	0.0473	0.12	Q
5.51	0.0492	0.13	Q
5.70	0.0511	0.13	Q
5.88	0.0530	0.13	Q
6.06	0.0550	0.13	Q
6.25	0.0570	0.13	Q
6.43	0.0590	0.13	Q
6.62	0.0610	0.13	Q
6.80	0.0631	0.14	Q
6.98	0.0652	0.14	Q
7.17	0.0673	0.14	Q
7.35	0.0694	0.14	Q
7.54	0.0716	0.14	Q
7.72	0.0738	0.15	Q
7.90	0.0760	0.15	Q
8.09	0.0782	0.15	Q
8.27	0.0805	0.15	Q
8.46	0.0828	0.15	Q
8.64	0.0852	0.16	Q
8.82	0.0876	0.16	Q
9.01	0.0900	0.16	Q
9.19	0.0925	0.16	Q
9.38	0.0950	0.17	Q
9.56	0.0975	0.17	Q
9.74	0.1001	0.17	Q
9.93	0.1028	0.18	Q
10.11	0.1055	0.18	Q
10.30	0.1082	0.18	Q

10.48	0.1110	0.19	Q
10.66	0.1139	0.19	Q
10.85	0.1168	0.19	Q
11.03	0.1198	0.20	Q
11.22	0.1228	0.20	Q
11.40	0.1260	0.21	Q
11.58	0.1291	0.21	Q
11.77	0.1324	0.22	Q
11.95	0.1358	0.22	Q
12.14	0.1395	0.26	.Q
12.32	0.1437	0.29	.Q
12.50	0.1481	0.30	.Q
12.69	0.1527	0.30	.Q
12.87	0.1574	0.31	.Q
13.06	0.1622	0.32	.Q
13.24	0.1672	0.34	.Q
13.42	0.1724	0.34	.Q
13.61	0.1777	0.36	.Q
13.79	0.1833	0.37	.Q
13.98	0.1892	0.39	.Q
14.16	0.1953	0.41	.Q
14.34	0.2019	0.45	.Q
14.53	0.2089	0.47	.Q
14.71	0.2164	0.51	. Q
14.90	0.2243	0.54	. Q
15.08	0.2330	0.60	. Q
15.26	0.2424	0.64	. Q
15.45	0.2527	0.71	. Q
15.63	0.2637	0.73	. Q
15.82	0.2773	1.06	. Q
16.00	0.2965	1.46	. Q
16.18	0.3407	4.36	. Q
16.37	0.3803	0.85	. Q
16.55	0.3921	0.69	. Q
16.74	0.4017	0.57	. Q
16.92	0.4097	0.49	.Q
17.10	0.4167	0.44	.Q
17.29	0.4230	0.38	.Q
17.47	0.4286	0.35	.Q
17.66	0.4338	0.33	.Q
17.84	0.4386	0.31	.Q
18.02	0.4432	0.29	.Q
18.21	0.4471	0.23	Q
18.39	0.4505	0.22	Q
18.58	0.4537	0.21	Q
18.76	0.4567	0.20	Q
18.94	0.4597	0.19	Q
19.13	0.4625	0.18	Q
19.31	0.4651	0.17	Q
19.50	0.4677	0.17	Q
19.68	0.4703	0.16	Q
19.86	0.4727	0.16	Q
20.05	0.4750	0.15	Q
20.23	0.4773	0.15	Q
20.42	0.4795	0.14	Q
20.60	0.4817	0.14	Q
20.78	0.4838	0.14	Q
20.97	0.4859	0.13	Q
21.15	0.4879	0.13	Q
21.34	0.4898	0.13	Q
21.52	0.4918	0.12	Q
21.70	0.4936	0.12	Q
21.89	0.4955	0.12	Q

22.07	0.4973	0.12	Q
22.26	0.4990	0.12	Q
22.44	0.5008	0.11	Q
22.62	0.5025	0.11	Q
22.81	0.5042	0.11	Q
22.99	0.5058	0.11	Q
23.18	0.5074	0.11	Q
23.36	0.5090	0.10	Q
23.54	0.5106	0.10	Q
23.73	0.5121	0.10	Q
23.91	0.5136	0.10	Q
24.10	0.5151	0.10	Q
24.28	0.5159	0.00	Q

WHOLE HYDROGRAPH MITIGATION

General Plan Build Out

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.66
TOTAL CATCHMENT AREA(ACRES) = 3.80
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.030
LOW LOSS FRACTION = 0.000
TIME OF CONCENTRATION(MIN.) = 11.04
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 2
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53
3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89
6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22
24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.43
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.22

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0. 2.5 5.0 7.5 10.0
0.18	0.0006	0.08	Q
0.36	0.0018	0.08	Q
0.54	0.0031	0.08	Q
0.73	0.0043	0.08	Q
0.91	0.0056	0.08	Q
1.10	0.0068	0.08	Q
1.28	0.0081	0.08	Q
1.46	0.0094	0.08	Q
1.65	0.0107	0.09	Q
1.83	0.0120	0.09	Q
2.02	0.0133	0.09	Q
2.20	0.0146	0.09	Q
2.38	0.0159	0.09	Q
2.57	0.0173	0.09	Q
2.75	0.0186	0.09	Q
2.94	0.0200	0.09	Q

3.12	0.0214	0.09	Q
3.30	0.0228	0.09	Q
3.49	0.0242	0.09	Q
3.67	0.0256	0.09	Q
3.86	0.0270	0.09	Q
4.04	0.0285	0.10	Q
4.22	0.0299	0.10	Q
4.41	0.0314	0.10	Q
4.59	0.0329	0.10	Q
4.78	0.0344	0.10	Q
4.96	0.0359	0.10	Q
5.14	0.0375	0.10	Q
5.33	0.0390	0.10	Q
5.51	0.0406	0.10	Q
5.70	0.0422	0.10	Q
5.88	0.0438	0.11	Q
6.06	0.0454	0.11	Q
6.25	0.0470	0.11	Q
6.43	0.0487	0.11	Q
6.62	0.0503	0.11	Q
6.80	0.0520	0.11	Q
6.98	0.0538	0.11	Q
7.17	0.0555	0.11	Q
7.35	0.0573	0.12	Q
7.54	0.0590	0.12	Q
7.72	0.0608	0.12	Q
7.90	0.0627	0.12	Q
8.09	0.0645	0.12	Q
8.27	0.0664	0.12	Q
8.46	0.0683	0.13	Q
8.64	0.0703	0.13	Q
8.82	0.0723	0.13	Q
9.01	0.0743	0.13	Q
9.19	0.0763	0.14	Q
9.38	0.0784	0.14	Q
9.56	0.0805	0.14	Q
9.74	0.0826	0.14	Q
9.93	0.0848	0.15	Q
10.11	0.0870	0.15	Q
10.30	0.0893	0.15	Q
10.48	0.0916	0.15	Q
10.66	0.0939	0.16	Q
10.85	0.0964	0.16	Q
11.03	0.0988	0.16	Q
11.22	0.1013	0.17	Q
11.40	0.1039	0.17	Q
11.58	0.1065	0.17	Q
11.77	0.1093	0.18	Q
11.95	0.1120	0.18	Q
12.14	0.1151	0.22	Q
12.32	0.1185	0.24	Q
12.50	0.1222	0.25	Q
12.69	0.1259	0.25	Q
12.87	0.1298	0.26	.Q
13.06	0.1338	0.27	.Q
13.24	0.1379	0.28	.Q
13.42	0.1422	0.28	.Q
13.61	0.1466	0.30	.Q
13.79	0.1512	0.31	.Q
13.98	0.1561	0.33	.Q
14.16	0.1611	0.34	.Q
14.34	0.1665	0.37	.Q
14.53	0.1723	0.39	.Q

14.71	0.1785	0.42	.Q
14.90	0.1851	0.44	.Q
15.08	0.1922	0.50	.Q
15.26	0.2000	0.53	. Q
15.45	0.2085	0.59	. Q
15.63	0.2175	0.60	. Q
15.82	0.2288	0.88	. Q
16.00	0.2446	1.20	. Q
16.18	0.2811	3.60	. Q
16.37	0.3138	0.70	. Q
16.55	0.3235	0.57	. Q
16.74	0.3314	0.47	.Q
16.92	0.3380	0.40	.Q
17.10	0.3438	0.36	.Q
17.29	0.3490	0.32	.Q
17.47	0.3536	0.29	.Q
17.66	0.3578	0.27	.Q
17.84	0.3618	0.25	.Q
18.02	0.3656	0.24	Q
18.21	0.3689	0.19	Q
18.39	0.3716	0.18	Q
18.58	0.3743	0.17	Q
18.76	0.3768	0.16	Q
18.94	0.3792	0.16	Q
19.13	0.3815	0.15	Q
19.31	0.3837	0.14	Q
19.50	0.3859	0.14	Q
19.68	0.3880	0.13	Q
19.86	0.3900	0.13	Q
20.05	0.3919	0.13	Q
20.23	0.3938	0.12	Q
20.42	0.3956	0.12	Q
20.60	0.3974	0.12	Q
20.78	0.3991	0.11	Q
20.97	0.4008	0.11	Q
21.15	0.4025	0.11	Q
21.34	0.4041	0.11	Q
21.52	0.4057	0.10	Q
21.70	0.4073	0.10	Q
21.89	0.4088	0.10	Q
22.07	0.4103	0.10	Q
22.26	0.4117	0.10	Q
22.44	0.4131	0.09	Q
22.62	0.4146	0.09	Q
22.81	0.4159	0.09	Q
22.99	0.4173	0.09	Q
23.18	0.4186	0.09	Q
23.36	0.4199	0.09	Q
23.54	0.4212	0.08	Q
23.73	0.4225	0.08	Q
23.91	0.4238	0.08	Q
24.10	0.4250	0.08	Q
24.28	0.4256	0.00	Q

PEAK SHAVING

Flow Through Basin to Mitigate Peak Exceedence Contribution for Existing Watershed

==========

FLOW PASS A FLOW-BY STRUCTURE:

```
                    INFLOW
                      |
                      |
                      |
          ---------   |
         |         |  |
         |         |<--* <=flow-by structure
         |  basin  |  |
         | storage |  |
          ---------   |
                      |
                      |
                      V
                    STREAM
                    FLOW-BY
```

INFLOW-VS.-OUTFLOW INFORMATION :

INFLOW (CFS)	OUTFLOW(CFS)
0.000	0.000
4.380	4.380
4.390	4.380
9.000	4.380

FLOW-BY BASIN MODELING RESULTS:

MODEL TIME (HRS)	INFLOW (CFS)	FLOW-BY (CFS)	BASIN VOLUME (AF)
0.176	0.19	0.19	0.000
0.360	0.20	0.20	0.000
0.544	0.20	0.20	0.000
0.728	0.20	0.20	0.000
0.912	0.20	0.20	0.000
1.096	0.20	0.20	0.000
1.280	0.20	0.20	0.000
1.464	0.21	0.21	0.000
1.648	0.21	0.21	0.000
1.832	0.21	0.21	0.000
2.016	0.21	0.21	0.000
2.200	0.21	0.21	0.000
2.384	0.21	0.21	0.000
2.568	0.22	0.22	0.000
2.752	0.22	0.22	0.000
2.936	0.22	0.22	0.000
3.120	0.22	0.22	0.000
3.304	0.22	0.22	0.000
3.488	0.23	0.23	0.000
3.672	0.23	0.23	0.000
3.856	0.23	0.23	0.000
4.040	0.23	0.23	0.000
4.224	0.23	0.23	0.000
4.408	0.24	0.24	0.000
4.592	0.24	0.24	0.000
4.776	0.24	0.24	0.000
4.960	0.24	0.24	0.000

5.144	0.25	0.25	0.000
5.328	0.25	0.25	0.000
5.512	0.25	0.25	0.000
5.696	0.25	0.25	0.000
5.880	0.26	0.26	0.000
6.064	0.26	0.26	0.000
6.248	0.26	0.26	0.000
6.432	0.27	0.27	0.000
6.616	0.27	0.27	0.000
6.800	0.27	0.27	0.000
6.984	0.28	0.28	0.000
7.168	0.28	0.28	0.000
7.352	0.28	0.28	0.000
7.536	0.29	0.29	0.000
7.720	0.29	0.29	0.000
7.904	0.29	0.29	0.000
8.088	0.30	0.30	0.000
8.272	0.30	0.30	0.000
8.456	0.31	0.31	0.000
8.640	0.31	0.31	0.000
8.824	0.32	0.32	0.000
9.008	0.32	0.32	0.000
9.192	0.33	0.33	0.000
9.376	0.33	0.33	0.000
9.560	0.34	0.34	0.000
9.744	0.34	0.34	0.000
9.928	0.35	0.35	0.000
10.112	0.36	0.36	0.000
10.296	0.37	0.37	0.000
10.480	0.37	0.37	0.000
10.664	0.38	0.38	0.000
10.848	0.39	0.39	0.000
11.032	0.40	0.40	0.000
11.216	0.41	0.41	0.000
11.400	0.42	0.42	0.000
11.584	0.43	0.43	0.000
11.768	0.44	0.44	0.000
11.952	0.45	0.45	0.000
12.136	0.54	0.54	0.000
12.320	0.60	0.60	0.000
12.504	0.62	0.62	0.000
12.688	0.63	0.63	0.000
12.872	0.66	0.66	0.000
13.056	0.67	0.67	0.000
13.240	0.70	0.70	0.000
13.424	0.72	0.72	0.000
13.608	0.75	0.75	0.000
13.792	0.77	0.77	0.000
13.976	0.82	0.82	0.000
14.160	0.84	0.84	0.000
14.344	0.90	0.90	0.000
14.528	0.94	0.94	0.000
14.712	1.02	1.02	0.000
14.896	1.07	1.07	0.000
15.080	1.20	1.20	0.000
15.264	1.28	1.28	0.000
15.448	1.42	1.42	0.000
15.632	1.46	1.46	0.000
15.816	2.15	2.15	0.000
16.000	2.97	2.97	0.000
16.184	8.81	4.38	0.067
16.368	1.70	1.70	0.067
16.552	1.39	1.39	0.067

hydrographs

16.736	1.13	1.13	0.067
16.920	0.98	0.98	0.067
17.104	0.87	0.87	0.067
17.288	0.79	0.79	0.067
17.472	0.73	0.73	0.067
17.656	0.68	0.68	0.067
17.840	0.64	0.64	0.067
18.024	0.61	0.61	0.067
18.208	0.46	0.46	0.067
18.392	0.43	0.43	0.067
18.576	0.41	0.41	0.067
18.760	0.39	0.39	0.067
18.944	0.38	0.38	0.067
19.128	0.36	0.36	0.067
19.312	0.35	0.35	0.067
19.496	0.34	0.34	0.067
19.680	0.33	0.33	0.067
19.864	0.32	0.32	0.067
20.048	0.31	0.31	0.067
20.232	0.30	0.30	0.067
20.416	0.29	0.29	0.067
20.600	0.28	0.28	0.067
20.784	0.27	0.27	0.067
20.968	0.27	0.27	0.067
21.152	0.26	0.26	0.067
21.336	0.26	0.26	0.067
21.520	0.25	0.25	0.067
21.704	0.24	0.24	0.067
21.888	0.24	0.24	0.067
22.072	0.24	0.24	0.067
22.256	0.23	0.23	0.067
22.440	0.23	0.23	0.067
22.624	0.22	0.22	0.067
22.808	0.22	0.22	0.067
22.992	0.21	0.21	0.067
23.176	0.21	0.21	0.067
23.360	0.21	0.21	0.067
23.544	0.20	0.20	0.067
23.728	0.20	0.20	0.067
23.912	0.20	0.20	0.067
24.096	0.20	0.20	0.067
24.280	0.00	0.00	0.067

==========

Flow Through Basin to Mitigate Peak Exceedence Contribution for General Plan Build Out

==========

FLOW PASS A FLOW-BY STRUCTURE:

```
                    INFLOW
                       |
                       |
                       |
            ---------  |
           |         | |
           |         |<--* <=flow-by structure
           |  basin  | |
           | storage |  |
            ---------  |
```


hydrographs

```
|
|
V
STREAM
FLOW-BY
```

INFLOW-VS.-OUTFLOW INFORMATION :

INFLOW (CFS)	OUTFLOW(CFS)
0.000	0.000
3.580	3.580
3.590	3.580
9.000	3.580

FLOW-BY BASIN MODELING RESULTS:

MODEL TIME (HRS)	INFLOW (CFS)	FLOW-BY (CFS)	BASIN VOLUME (AF)
0.176	0.19	0.19	0.000
0.360	0.20	0.20	0.000
0.544	0.20	0.20	0.000
0.728	0.20	0.20	0.000
0.912	0.20	0.20	0.000
1.096	0.20	0.20	0.000
1.280	0.20	0.20	0.000
1.464	0.21	0.21	0.000
1.648	0.21	0.21	0.000
1.832	0.21	0.21	0.000
2.016	0.21	0.21	0.000
2.200	0.21	0.21	0.000
2.384	0.21	0.21	0.000
2.568	0.22	0.22	0.000
2.752	0.22	0.22	0.000
2.936	0.22	0.22	0.000
3.120	0.22	0.22	0.000
3.304	0.22	0.22	0.000
3.488	0.23	0.23	0.000
3.672	0.23	0.23	0.000
3.856	0.23	0.23	0.000
4.040	0.23	0.23	0.000
4.224	0.23	0.23	0.000
4.408	0.24	0.24	0.000
4.592	0.24	0.24	0.000
4.776	0.24	0.24	0.000
4.960	0.24	0.24	0.000
5.144	0.25	0.25	0.000
5.328	0.25	0.25	0.000
5.512	0.25	0.25	0.000
5.696	0.25	0.25	0.000
5.880	0.26	0.26	0.000
6.064	0.26	0.26	0.000
6.248	0.26	0.26	0.000
6.432	0.27	0.27	0.000
6.616	0.27	0.27	0.000
6.800	0.27	0.27	0.000
6.984	0.28	0.28	0.000
7.168	0.28	0.28	0.000
7.352	0.28	0.28	0.000
7.536	0.29	0.29	0.000

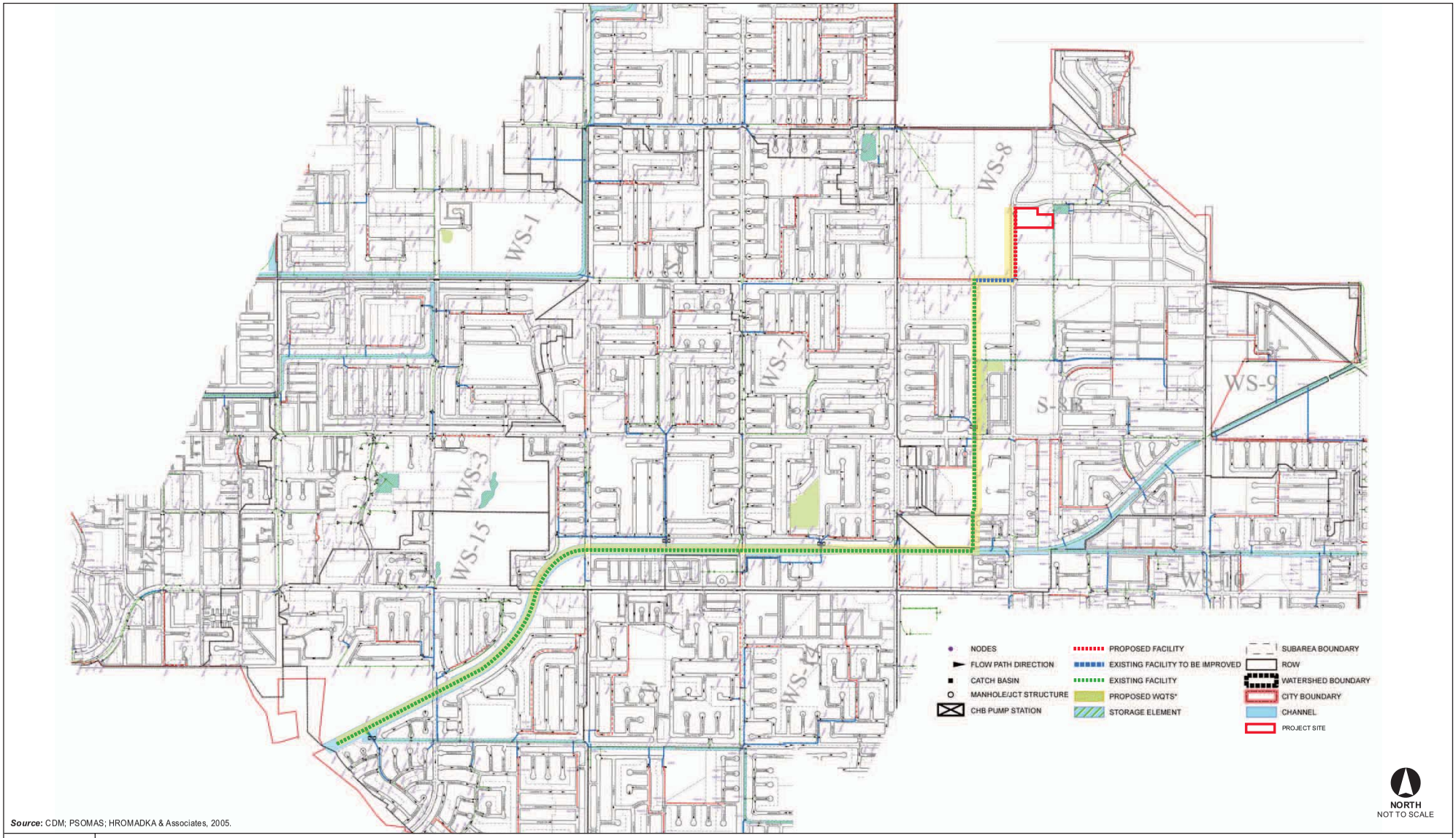
7.720	0.29	0.29	0.000
7.904	0.29	0.29	0.000
8.088	0.30	0.30	0.000
8.272	0.30	0.30	0.000
8.456	0.31	0.31	0.000
8.640	0.31	0.31	0.000
8.824	0.32	0.32	0.000
9.008	0.32	0.32	0.000
9.192	0.33	0.33	0.000
9.376	0.33	0.33	0.000
9.560	0.34	0.34	0.000
9.744	0.34	0.34	0.000
9.928	0.35	0.35	0.000
10.112	0.36	0.36	0.000
10.296	0.37	0.37	0.000
10.480	0.37	0.37	0.000
10.664	0.38	0.38	0.000
10.848	0.39	0.39	0.000
11.032	0.40	0.40	0.000
11.216	0.41	0.41	0.000
11.400	0.42	0.42	0.000
11.584	0.43	0.43	0.000
11.768	0.44	0.44	0.000
11.952	0.45	0.45	0.000
12.136	0.54	0.54	0.000
12.320	0.60	0.60	0.000
12.504	0.62	0.62	0.000
12.688	0.63	0.63	0.000
12.872	0.66	0.66	0.000
13.056	0.67	0.67	0.000
13.240	0.70	0.70	0.000
13.424	0.72	0.72	0.000
13.608	0.75	0.75	0.000
13.792	0.77	0.77	0.000
13.976	0.82	0.82	0.000
14.160	0.84	0.84	0.000
14.344	0.90	0.90	0.000
14.528	0.94	0.94	0.000
14.712	1.02	1.02	0.000
14.896	1.07	1.07	0.000
15.080	1.20	1.20	0.000
15.264	1.28	1.28	0.000
15.448	1.42	1.42	0.000
15.632	1.46	1.46	0.000
15.816	2.15	2.15	0.000
16.000	2.97	2.97	0.000
16.184	8.81	3.58	0.079
16.368	1.70	1.70	0.079
16.552	1.39	1.39	0.079
16.736	1.13	1.13	0.079
16.920	0.98	0.98	0.079
17.104	0.87	0.87	0.079
17.288	0.79	0.79	0.079
17.472	0.73	0.73	0.079
17.656	0.68	0.68	0.079
17.840	0.64	0.64	0.079
18.024	0.61	0.61	0.079
18.208	0.46	0.46	0.079
18.392	0.43	0.43	0.079
18.576	0.41	0.41	0.079
18.760	0.39	0.39	0.079
18.944	0.38	0.38	0.079
19.128	0.36	0.36	0.079

19.312	0.35	0.35	0.079
19.496	0.34	0.34	0.079
19.680	0.33	0.33	0.079
19.864	0.32	0.32	0.079
20.048	0.31	0.31	0.079
20.232	0.30	0.30	0.079
20.416	0.29	0.29	0.079
20.600	0.28	0.28	0.079
20.784	0.27	0.27	0.079
20.968	0.27	0.27	0.079
21.152	0.26	0.26	0.079
21.336	0.26	0.26	0.079
21.520	0.25	0.25	0.079
21.704	0.24	0.24	0.079
21.888	0.24	0.24	0.079
22.072	0.24	0.24	0.079
22.256	0.23	0.23	0.079
22.440	0.23	0.23	0.079
22.624	0.22	0.22	0.079
22.808	0.22	0.22	0.079
22.992	0.21	0.21	0.079
23.176	0.21	0.21	0.079
23.360	0.21	0.21	0.079
23.544	0.20	0.20	0.079
23.728	0.20	0.20	0.079
23.912	0.20	0.20	0.079
24.096	0.20	0.20	0.079
24.280	0.00	0.00	0.079

==========

Appendix F

Regional Drainage Map



Source: CDM; PSOMAS; HROMADKA & Associates, 2005.

FIGURE **F.1**

Regional Storm Drain System Capacity

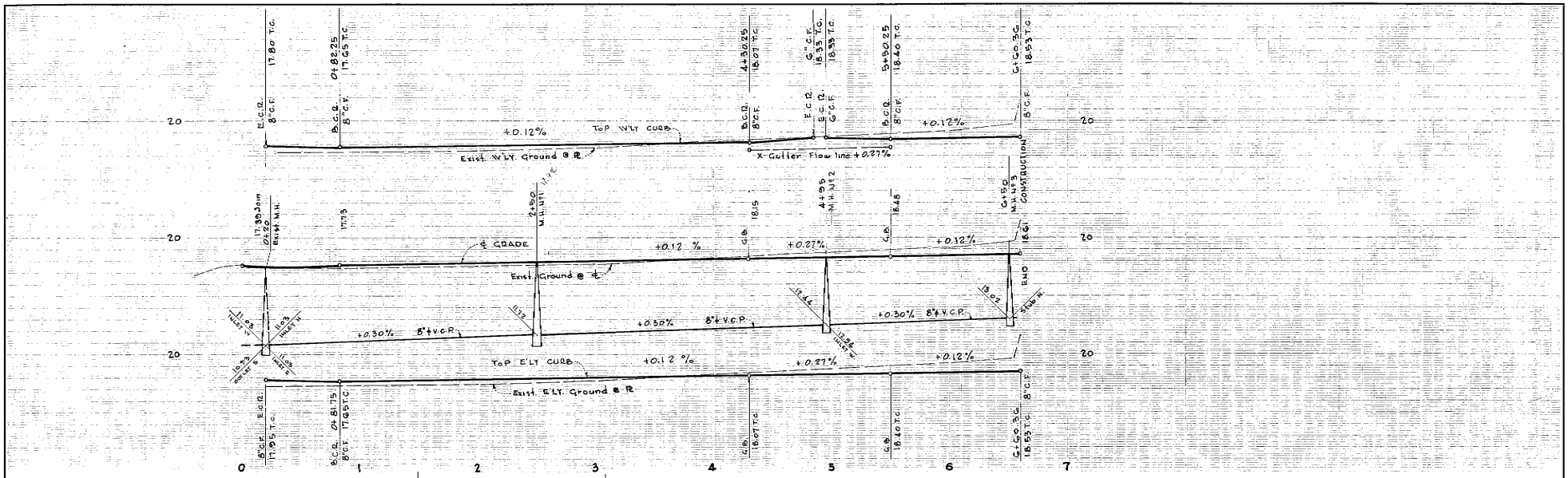
0D2138700

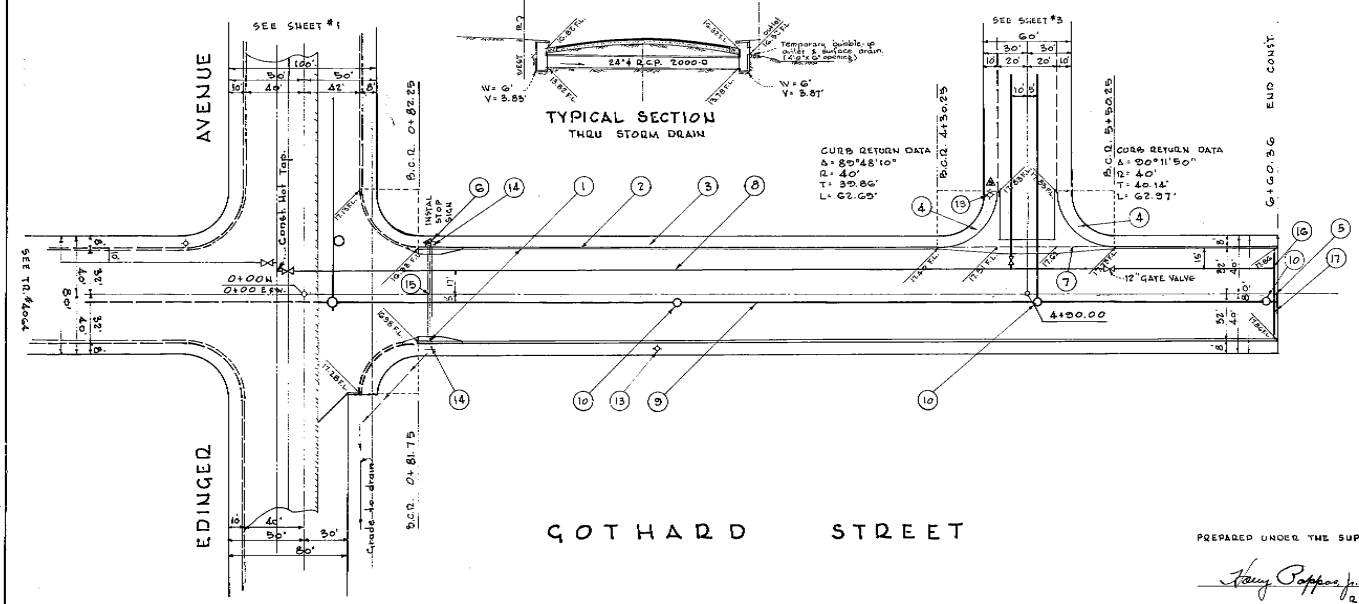
The Ripcurl

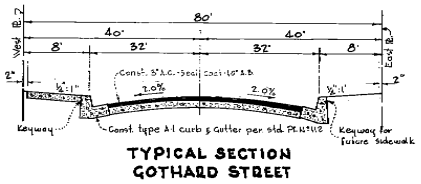
03002 | JCS | 08

Appendix G

Gothard Street As Builts







B.M.
O.C.S. - B.M. TAG STAMPED "2E BGL" IN THE TOP OF HEADWALL NE OF THE INTERSECTION OF EDINGER AVE. & THE P.E.R.R.
ELEV. 22.76 - 1988

PREPARED UNDER THE SUPERVISION OF HARRY PAPPAS, JR.

Harry Pappas Jr. 26, MARCH, 1963
R.C.E. No. 11952

2015

CITY OF HUNTINGTON BEACH		
PLAN AND PROFILE GOTHARD STREET NORTH OF EDINGER AVENUE		
DWG. BY H.J.P. CHECKED	APPROVED CITY ENGR.	DATE DWG. NO. 2 of 3

GP33-111