Appendix J Preliminary/Conceptual Draft Water Quality Management Plan

Appendices

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PRELIMINARY/CONCEPTUAL DRAFT WATER QUALITY MANAGEMENT PLAN

Project Address:
South of Lambert Road and Valencia Avenue
City of Brea, CA

Prepared For:

3030 Saturn Street, Suite 101
Brea, CA 92821
(714) 577-9154

Prepared By:

Hunsaker & Associates Irvine, Inc.
3 Hughes
Irvine, CA 92618
(949) 583-1010

WQMP Preparation Date:
May 1, 2021
Revised (November 15, 2021; January 18, 2022; February 11, 2022)

PRELIMINARY/CONCEPTUAL DRAFT WATER QUALITY MANAGEMENT PLAN

"BREA 265"

South of Lambert Road and Valencia Avenue

City of Brea, California

PRELIMINARY/CONCEPTUAL DRAFT WATER QUALITY MANAGEMENT PLAN (WQMP)

Project Name:

BREA 265

Northwest, Southwest and Southeast of Lambert Road and Valencia Avenue

Brea, California

Prepared for:

AERA

3030 Saturn Street, Suite 101
Brea, CA 92821
(714) 577-9154

Prepared by:

Hunsaker and Associates Irvine, Inc.

Engineer: Ed Mandich Registration No.: 59089

Three Hughes
Irvine, CA 92618
(949) 583-1010

Prepared: May 1, 2021
(Revised: November 15, 2021; January 18, 2022; February 11, 2022)

Project Owner's Certification			
Permit/Planning Application No.	CD0449	Grading Permit No.	N/A
Tract/Parcel Map No.	TBD	Building Permit No.	N/A
CUP, SUP and/or APN (Specify Lot Numbers if Portions of Tract)			APN No. 320-073-08; 320-071-29; 308-011-23; 322-031-24; 322-031-12; 322-031-13; 322-031-14, -19, -20 & -21

This Water Quality Management Plan (WQMP) has been prepared for Aera Energy LLC. by Hunsaker and Associates Irvine, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

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 the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for 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. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Aera Energy LLC.			
Name/Title			
Company	Aera Energy LLC.		
Address	3030 Saturn Street, Suite 101 Brea, CA 92821		
Email			
Telephone #	(714) 577-9154		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Signature		Date	

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Attachment A ..... Educational Materials
Attachment B ..... BMP Worksheets/Calculations & BMP Details
Attachment C ..... Hydromodification Analysis
Attachment D ..... Supporting Project Information
Attachment E ..... City Plan Check Correspondence

SECTION I DISCRETIONARY PERMIT(S) AND WATER QUALITY CONDITIONS

The project's discretionary permit and water quality information are provided in the following:

PROJECT INFORMATION			
Permit/Application No.	CD0449	Tract/Parcel Map No.	TBD
Additional Information/ Comments:	This Preliminary Water Quality Management Plan has been developed in accordance with Section 7.II-1.5 of the Model Water Quality Management Plan and provides the basic framework to address the water quality component for each anticipated phase of the Brea 265 project.		
WATER QUALITY CONDITIONS			
Water Quality Conditions (list verbatim.)	The project is considered a priority project under the City of Brea Local Implementation Plan and Water Quality Ordinance (City Code Section 13.32.030). Therefore, the project is subject to the requirements of a Water Quality Management Plan (WQMP) to minimize the adverse effects of urbanization on site hydrology, runoff flow rates and pollutant loads. The project is in the preliminary planning phase of development, with this preliminary document prepared to support the environmental documents (CEQA) for the Brea 265 project. There are currently no site-specific water quality conditions of approval for the project.		
WATERSHED-BASED PLAN CONDITIONS			
Provide applicable conditions from watershed-based plans including WIHMPs and TMDLs	The project resides within the San Gabriel River – Coyote Creek Watershed (project areas west of Valencia Avenue) and the Santa Ana River Watershed (project areas east of Valencia Avenue). 303(d) and TMDL (in italic) Listed impairments for the project's receiving waters are as follows: San Gabriel River – Coyote Creek Watershed: Loftus Diversion Channel (Facility A06) – None Fullerton Creek Channel (Facility A03) – None Coyote Creek Channel (Facility A01) – *Copper*, *Indicator Bacteria,* Iron, Malathion, pH, Toxicity San Gabriel River Reach 1 – pH, Temperature San Gabriel River Estuary – *Copper*, Dioxin, *Indicator Bacteria*, Nickel, Dissolved Oxygen		

	Santa Ana River Watershed: Carbon Canyon Creek Channel (E03) – None Carbon Canyon Creek Diversion Channel (E02) – None Santa Ana River (E01) Reach 3 – None Santa Ana River (E01) Reach 2 – None There is currently no approved WIHMP for either watershed.

SECTION II PROJECT DESCRIPTION

II.1 PROJECT DESCRIPTION

<table>
<tr><th colspan="3">DESCRIPTION OF PROPOSED PROJECT</th></tr>
<tr><td>Development Category (Verbatim from WQMP):</td><td colspan="2">This project is considered a priority project under the following categories:

Priority Project, Category 1 – New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.

Priority Project, Category 4 – Hillside development greater than 5,000 square feet. Hillside development is defined as any development which is located in an area with known erosive soil conditions or where the natural slope is twenty-five percent or greater.

Priority Project, Category 6 – Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban stormwater runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.

Priority Project, Category 7 – Streets, road, highways and freeways. This Category includes any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles and other vehicles.</td></tr>
<tr><td>Project Area (ft^2):
11,417,076 ft^2
(262.1 Ac.)[1]</td><td>Number of Dwelling Units: up to 1,100 residential units</td><td>SIC Code: No facilities subject to Standard Industrial Classification anticipated. Residential, parks, streets and open space / trail improvements only.</td></tr>
<tr><td>Narrative Project Description:</td><td colspan="2">The proposed "Brea 265" project (the Project) is master planned residential community of great neighborhoods, offering a mix of residential, open space and recreational opportunities that are organized and connected by public trails, parks and adjacent open spaces.

The approximately 262.1-acre (gross area) project is located within the central portion of the City of Brea and in unincorporated land within the City of Brea's Sphere of Influence and is located just northwest, southwest and southeast of the intersection of Lambert Road and Valencia Avenue. These areas are referenced in this WQMP as Northwestern, Southwestern and Eastern Project Areas, respectively.</td></tr>
</table>

[1] Project gross area based on property/tract limits. Net improvement areas, hydrological boundaries and BMP Drainage Management Areas will differ based on project grading, proposed improvements areas, developed drainage areas and BMP management areas.

DESCRIPTION OF PROPOSED PROJECT

Specially, the project is bound to the north by existing residential homes, oil field use and Lambert Road (State Route 142); to the east by Valencia Avenue (for Northwestern Site), vacant land and existing golf course (for Eastern Site); to the south by Brea Sports Park, an existing elementary school (Southwestern Site) and Blake Road (Eastern Site); and to the west by Rose Road (Eastern Site) and existing residential homes (Western Site).

The project will include thirteen (13) planning areas with the following general land uses:

- A mix of approximately 1,100 residential units (450 Low Density Residential – LDR; 650 Medium Density Residential – MDR);
- 15.1 acres of parks/recreation uses; and
- 42.7 acres of open space.

These land use areas will be linked together through a trail system that connects the park/recreation areas to the adjacent neighborhoods and offsite-parks, open space, employment centers and retail venues.

Proposed land use summary is provided in the following table, with additional description provided in the following text:

Land Use	Acreage	Density Range	Dwelling Units
Low Density Residential	135.1	1-6 du/ac	450
Medium Density Residential	62.9	6.1-12.0 du/ac	650
Parks/Paseo/ Parkways	15.1	--	--
Open Space/ Slopes	47.0	--	--
Master Plan Roadways	2.0	--	--
Total	**262.1**	**--**	**1,100**

Residential

Low density designation will consist of approximately 450 units covering approximately 135.1 acres within the northwestern and western portions of the project site.

Medium density designation will consist of approximately 650 units covering approximately 62.9 acres within the southwestern and southeastern portions of the project area. See Exhibit 3-1 Land Use Plan from the Brea 265 Specific Plan at the end of this discussion.

Park/Recreation

Approximately 15.1 acres of the site are designated for passive neighborhood parks/vista points throughout the project. Some of the parks and vista point areas will take advantage of views from higher elevations within the site. In addition, as individual planning areas are developed, the creation of smaller neighborhood/mini parks is anticipated to provide walkable small scale recreation opportunities for residents within the proposed residential neighborhoods. Proposed park and community recreation amenities will differ from park to park and are anticipated to include swimming pool and spa facilities, lounge/media room, multi-purpose room, children's play areas, dog parks, hiking trails, shade structures with seating areas, open lawn areas, game courts, barbecue facilities, community event space, community gardens, natural open space and designated parking areas.

Open Space

Approximately 47.0 acres of the site are designated as open space which are areas left in its original condition or within revegetated slope areas and setback areas away from historical oil well sites, and/or other conditions preventing development from occurring within these areas.

TABLE 3-2
SPECIFIC PLAN STATISTICAL SUMMARY BY PLANNING AREA

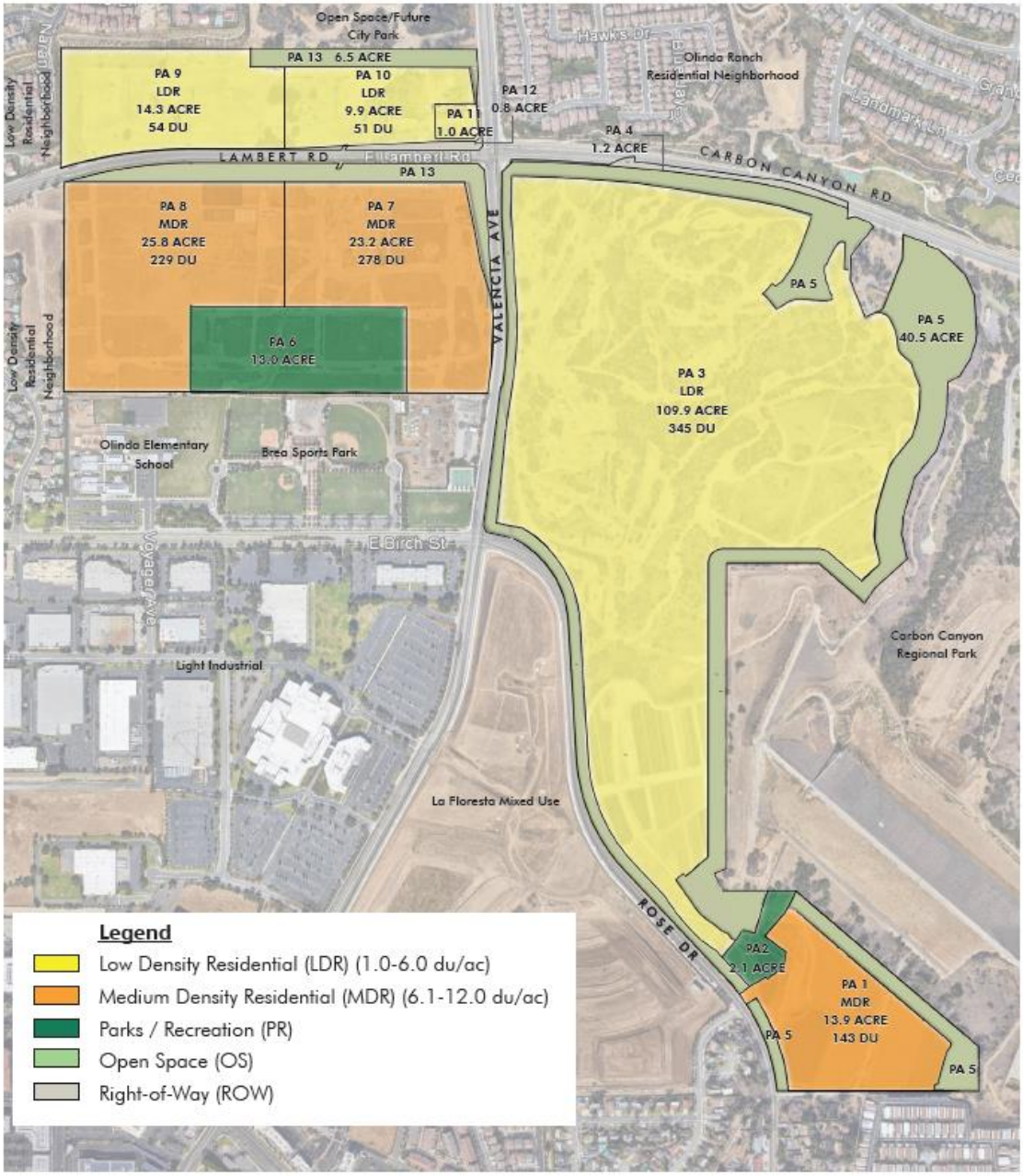
Planning Area (PA)	Land Use Category	Gross Area (AC)	Density Range (DU/AC)	Target Density (DU/AC)	Dwelling Units (DU) *
1	MDR	13.9	6.1-12.0	10.3	143
2	PR	2.1	N/A	N/A	N/A
3	LDR	109.9	1.0-6.0	3.1	345
4	ROW	1.2	N/A	N/A	N/A
5	OS	40.5	N/A	N/A	N/A
6	PR	13.0	N/A	N/A	N/A
7	MDR	23.2	6.1-12.0	7.7	278
8	MDR	25.8	6.1-12.0	8.9	229
9	LDR	14.3	1.0-6.0	3.8	54
10	LDR	9.9	1.0-6.0	5.2	51
11**	LDR	1.0	1.0-6.0	N/A	N/A
12	ROW	0.8	N/A	N/A	N/A
13	OS	6.5	N/A	N/A	N/A
Total		262.1		4.2	**1,100**

Circulation

The project will consist of approximately 34.8 acres of land dedicated to the roadway network necessary to serve the proposed project, with access provided from Lambert Road, Valencia Avenue and Rose Drive. The vehicular circulation system for the project consists of hierarchy of roadways ranging from 120' to 124' Major Arterial Roads (Lambert Road), 100' Primal Arterial Roads (Valencia Avenue and Rose Drive); and on-site roads consisting of 64' Enhanced Local Collector Roads and 58' Enhanced Local Streets. All roadway improvements will be designed to

DESCRIPTION OF PROPOSED PROJECT	
	comply with the City of Brea's Public Work standards for streets and roadways. See Circulation Plan Exhibit from the Brea 265 Area Plan provided at the end of this discussion. *Infrastructure* The proposed storm drain system will utilize underground conduit and surface drainage and will include water quality treatment as well as detention for flood runoff. The proposed sanitary sewer system will connect to both existing City of Brea infrastructure and Orange County Sanitation District infrastructure. The Domestic Water System will be a looped system tying into the existing City of Brea water system. Reclaimed or recycled water can be used for slope irrigation and fuel modification irrigation if available. Dry utilities, including electric, gas and TV will be provided base on demand requirements. *Parking* Parking will be provided via residential garage spaces, un-covered street parking and covered/uncovered parking lots. All dwelling units will have at minimum, a two-car garage, with uncovered parking spaces provided in private driveways or project streets. Covered and uncovered parking areas are anticipated for the project parks and other community facilities. Total parking shall be consistent with City of Brea requirements. *Pervious/Impervious Areas* Project pervious areas include designated open space lots, natural areas, park, trails, slopes, parkways and common landscaping areas, as well as within private areas of each residential unit. Total landscaping/pervious area is anticipated to consist of approximately 117.6 acres, or 44.8% of the site. Anticipated paved areas include project streets, sidewalks and hardscape, parking areas, building footprints and other impervious improvements. These improvements are anticipated to consist of approximately 144.5 acres, or 55.2% of the project site. *Trash* Typical household wastes are anticipated to be generated daily from the residential, parks and community facilities. Each single-family residential unit will have trash bins located/stored within the private residence of each home. Designated trash enclosures (and receptacles) are anticipated to address trash from community facilities. It is also anticipated that receptacles will be provided throughout the project's trails and parks for community use. All trash will be collected on a weekly basis (at minimum) by the contracted local waste disposal company.

DESCRIPTION OF PROPOSED PROJECT	
	Design information and locations of site-specific improvements for the project are not available at this time. Additional information for these improvements will be provided in future WQMP submittals to the City. All currently known improvements are shown in and the WQMP Site Plan in Section VI.

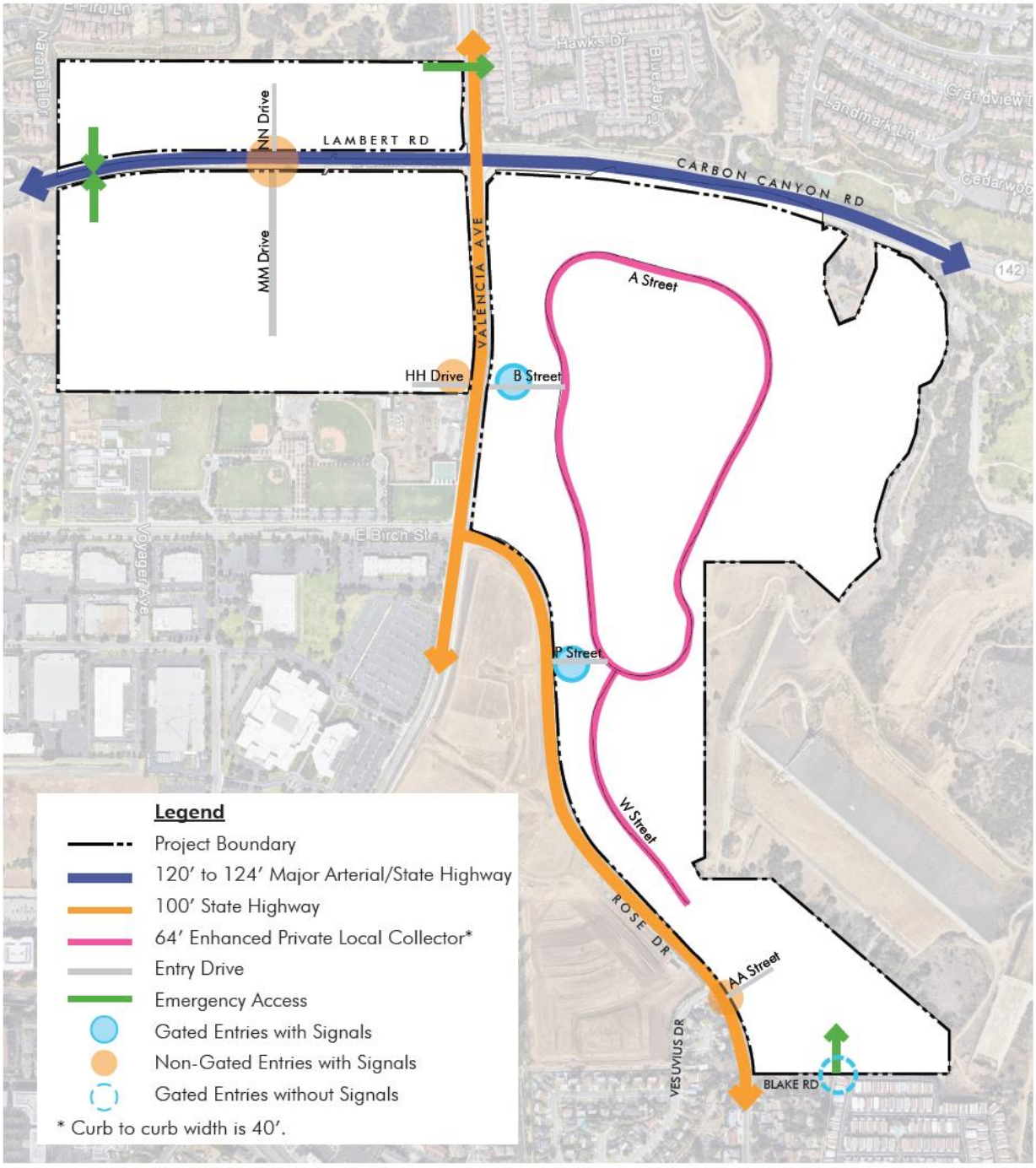


For illustrative purposes only; final design may vary.

N.T.S.

EXHIBIT 3-1, SPECIFIC PLAN LAND USE PLAN

DESCRIPTION OF PROPOSED PROJECT



For illustrative purposes only; location and alignment may vary.

EXHIBIT 3-3, CIRCULATION PLAN

N.T.S.

DESCRIPTION OF PROPOSED PROJECT				
Project Area	Pervious Surface		Impervious Surface	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	260.1	99.2%	2.0	0.8%
Post-Project Conditions	117.6	44.8%	144.5	55.2%
Drainage Patterns/Connections (Existing/Pre-Project)	In the pre-project condition, onsite drainage is divided into a Western Drainage and an Eastern Drainage. The Western Drainage consists of project areas west of Valencia Avenue and the Eastern Drainage consists of project areas east of Valencia Avenue. The Western Drainage totals approximately 96.4 acres and is divided into three sub-areas (A, B and C). Subarea Drainage "A" totals approximately 59.7 acres and consists of the eastern portion of the Western Drainage. A natural drainage traverses the drainage in a north to south direction. Runoff from areas north of Lambert Road is conveyed southerly toward Lambert Road and then centrally to the drainage. Similarly, runoff from the areas south of Lambert Road is primarily conveyed southerly to and then centrally prior to discharging to the drainage. Runoff is then conveyed southerly through Brea Sports Park prior to discharging to the Loftus Diversion Channel, which is tributary to Fullerton Creek Channel, Coyote Creek Channel, the San Gabriel River and ultimately the Pacific Ocean. Subarea "B" totals approximately 20.7 acres and consists of the northwestern portion of the Western Drainage. Runoff is conveyed southerly to an existing v-ditch located on the northern side of Lambert Road and then westerly to an existing inlet prior to discharging to the existing storm drain line in Lambert Road. Runoff is then conveyed westerly and southerly prior to discharging to the Loftus Diversion Channel. Subarea "C" totals approximately 16.0 acres and consists of the western-central portion of the Western Drainage. Runoff is conveyed southwesterly to an existing drainage prior to discharging to the existing 60" storm drain line in an adjacent residential development to the west and conveyed southwesterly to the Loftus Channel. The Eastern Drainage totals approximately 183.8 acres and consists of the Eastern Project Area (south of Lambert Road and east of Valencia Avenue). Carbon Canyon Channel traverses the site in a southerly direction and divides the southeastern portion of the project site from the remaining portion of the Eastern Project Area (from Carbon Canyon Channel) to just east of the intersection of Rose Drive and Vesuvius Drive. Runoff from the larger northwestern portion of this drainage area is conveyed as sheet flow westerly to a system of paved and unpaved drainages and then southerly prior to discharging to the Carbon Canyon			

DESCRIPTION OF PROPOSED PROJECT	
	Channel. Runoff from the southeastern portion of this drainage area is conveyed as sheet flow and via an unimproved drainage to a low area located northwest of the intersection of Blake Road and Rose Drive, prior to discharging to the Carbon Canyon Channel to the west. All runoff is then conveyed southerly to the Santa Ana River (via the Carbon Canyon Diversion Channel) and then westerly to the Pacific Ocean.

II.2 POTENTIAL STORMWATER POLLUTANTS

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type, from the Technical Guidance Document (December 2013) lists the following Pollutants of Concern (POC's) associated with the proposed development:

POLLUTANTS OF CONCERN			
Pollutant	Check One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended Solids/Sediment	E ☒	N ☐	Pollutant is a Primary POC. Potential sources of sediment include disturbed or unstabilized landscaping areas and disturbed earth surfaces.
Nutrients	E ☒	N ☐	Pollutant is Primary POC as downstream water is impaired for Nutrients. Potential sources of nutrients include fertilizers, sediment and trash/debris.
Heavy Metals	E ☒	N ☐	Pollutant is a Primary POC. Potential sources for the project include automobiles and uncovered parking areas.
Pathogens (Bacteria/Virus)	E ☒	N ☐	Pollutant is a Primary POC. Potential sources for the project include food wastes, pet wastes, sediment and landscaping areas.
Pesticides	E ☒	N ☐	Pollutant is a Primary POC. Potential sources of pesticides include landscaping and open space areas.
Oil and Grease	E ☒	N ☐	Potential sources include project streets and parked vehicles.
Toxic Organic Compounds	E ☒	N ☐	Pollutant is a Primary POC. Potential sources for the project include automobiles and uncovered parking areas.
Trash and Debris	E ☒	N ☐	Potential sources of trash and debris include landscaping activities, food wrappers and food wastes.

II.3 HYDROLOGIC CONDITIONS OF CONCERN

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. that may occur as the result of project implementation. As specified in Section 2.3.3 of the Model WQMP, projects must identify and mitigate any HCOCs. An HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that present a condition of concern for physical and/or biological degradation of streams.

The project resides within the jurisdiction of the Santa Ana RWQCB and is subject to the requirements of the North Orange County WQMP TGD, in which HCOCs are considered to exist if the volume for the 2-year runoff event for post-development condition exceeds pre-development condition by more than 5% or the time of concentration is less than the pre-development condition by greater than 5%.

Is the proposed project potentially susceptible to hydromodification impacts?

☐ No – Show map and/or describe and reference supporting documentation in the space below

☒ Yes – Describe applicable hydrologic conditions of concern in the space below.

The proposed project will increase the amount of impervious area located within the project site, thereby increasing runoff volume and rate. Based on the County's Technical Guidance Documents for Hydromodification Susceptibility (Figure XVI.3-1 Susceptibility Analysis for San Gabriel River-Coyote Creek and Figure XVI.3-3 Susceptibility Analysis for Santa Ana River in Attachment C), only project areas located west of Valencia Drive (Western Drainage Area that discharges to Loftus Channel) have potential hydromodification impacts.

A summary of the analysis for the Western Drainage is provided in the following table:

HCOC Analysis Summary (2-year event) for Western Drainage Area

Sub-Drainage Area	Existing Condition				Proposed Condition				Δ Acres	Δ Q_2 (cfs)	Δ Tc (min)	Δ V (ac-ft))
	Acres	Q_2 (cfs)	Tc (min)	V (ac-ft)	Acres[1]	Q_2 (cfs)	Tc (min)	V (ac-ft)				
A	59.70	49.90	16.86	1.97	66.90	80.80	13.99	8.12	+7.20	+30.90	-2.87	+6.15
B	20.70	20.40	13.44	0.76	16.20	18.20	13.16	1.69	-4.50	-2.20	-0.28	+0.93
C	16.00	13.50	16.78	0.55	10.50	15.20	8.73	1.40	-5.50	+1.70	-8.05	+0.85
Total	96.40	83.80	--	3.28	93.6	114.2	--	11.21	-2.8	+30.40	--	+7.93

[1] *Discrepancy in proposed condition Drainage acres resulting from edge grading effects and onsite routing of storm drain.*

To address the project's HCOC as well as overall increase in runoff for larger storm events, surface and sub-surface detention facilities are proposed in the western project site to detain the volume required to mitigate the difference between the project's pre- and post-development peak runoff and change in time of concentration at the each of the project's point of compliance (outlet) to the existing downstream drainage system. With implementation of the detention facilities, the project's hydromodification impacts (as well as impacts from larger storm events) will be minimized in the developed condition.

II.4 POST DEVELOPMENT DRAINAGE CHARACTERISTICS

The project's post-development drainage characteristics are described as follows:

In the developed condition, runoff from each of the project's two onsite drainage areas are consistent with pre-project drainage patterns, with each of the project's drainage areas discharging to the pre-existing storm drain connections downstream. Runoff is generally discharged to the backbone storm drain system via a system of area drains, curb and gutters and catch basin inlets. Runoff is then conveyed to the Loftus Channel and Carbon Canyon Channel, as in pre-project conditions.

Low Impact Development

To satisfy the project's requirements for Low Impact Development (LID) requirements and water quality treatment, water qualify runoff from each of the project's Drainage Management Areas (DMAs) are addressed via traditional bioretention BMPs (flow-through type due to contamination from oil extraction activities in existing project site) proprietary biotreatment BMPs (vault type) and open basins equipped with proprietary biotreatment media at basin bottom.

DMA 1 (11.02 acres) – Consists of the northwestern portion of the Western Project Area and is bound to the south by Lambert Road. Runoff from this DMA will be conveyed to a proposed bioretention (flow-through)/detention basin, located at the southwestern portion of the DMA. The BMP will also address hydromodification impacts. Alternative BMP for this DMA is the use of proprietary biotreatment media within the basin.

DMA 2 & 3 (2.18 acres; 1.97 acres) – Consists of westbound Lambert Road and eastbound Lambert Road, located just south of DMA 1. Runoff from these DMAs will be conveyed to a proprietary biofiltration BMP prior to discharging to the existing storm drain system in Lambert Road.

DMA 4 (10.50 acres) – Consists of the southwestern portion of the Western Project Area. Runoff is conveyed southwesterly to an underground detention vault that outlets through a proprietary biofiltration BMP. The detention vault will also address hydromodification impacts.

DMA 5 (25.47 acres) – Consists of the central-western and south-central portions of the Western Drainage Area. Runoff is conveyed southwesterly to an underground detention vault that outlets through a proprietary biofiltration BMP. The detention vault will also address hydromodification impacts.

DMA 6 (38.67 acres) – Consists northeastern portion and the central-eastern portions of the Western Drainage Area. Runoff is conveyed southerly and then southeasterly to an open basin that has been designed with proprietary biofiltration media. The basin will also provide mitigation for hydromodification impacts.

DMA 7 through 11 (0.73 acres, 0.55 acres, 0.26 acres, 0.43 acres & 0.79 acres) – Consists of the southeastern portion of the Western Drainage Area. Runoff from these DMAs will be conveyed to a proprietary biofiltration BMP prior to discharging to the backbone storm drain system.

DMA 12 (26.66 acres) – Consists of the northwestern portion of the Eastern Drainage Area. Runoff from this DMA is conveyed southerly to an open basin that has been designed with proprietary biofiltration media.

DMA 13 (51.62 acres) – Consists of the Northeastern portion of the project's Eastern Drainage Area. Runoff from this DMA is conveyed southerly to an open basin that has been designed with proprietary biofiltration media.

DMA 14 through 20; 22 through 24; 26 through 35; 37 through 40 & 42 through 43 (See Section IV.2.2 for acreages) - Consists of the central and southwestern portions of the Eastern Drainage Area. Runoff from these DMAs will be conveyed to a proprietary biofiltration BMP prior to discharging to the backbone storm drain system.

DMA 21 (1.52 acres) – Consists of open space area located just east of Valencia Avenue and Rose Drive. Runoff from this area will be conveyed to a bioretention (flow-through type) BMP or proprietary biofiltration BMP prior to discharging to the backbone storm drain system.

DMA 25 (3.21 acres) – Consists a small area located in the central-eastern portion of the Eastern Drainage Area. Runoff from this DMA is conveyed southerly to an open basin that has been designed with proprietary biofiltration media.

DMA 36 (9.86 acres) – Consists of the northern section of the southeastern portion of the project site. Runoff from this DMA is conveyed westerly to an open basin that has been designed with proprietary biofiltration media.

DMA 41 (20.12 acres) – Consists of the southeastern most portion of the project site. Runoff from this DMA is conveyed westerly to an open basin that has been designed with proprietary biofiltration media.

In addition the BMPs proposed, the project may also incorporate the use of BMPs prescribed in the US EPA's "Green Streets" guidance manual to a manner consistent with the Maximum Extent Practicable (MEP) standard (Section 2.7.2 of TGD) to address proposed improvements to Lambert Road and Valencia Avenue/Rose Drive. These include the use of other LID BMPs such as swales and planters, as well as structural BMPs (pervious pavement).

To meet the trash capture requirements of the Ocean Plan, full trash capture screens and/or hydrodynamic separator (CDS Unit) will be employed within the project's catch basins that are sized to accommodate the 1-year storm event.

II.5 PROPERTY OWNERSHIP/MANAGEMENT

The project proponent, Aera Energy LLC., shall assume all onsite BMP maintenance, inspection and funding responsibilities until such time, these activities have been turned over to the Homeowners Association (HOA). Inspection and maintenance activities are in Section V of this WQMP.

SECTION III SITE DESCRIPTION

III.1 PHYSICAL SETTING

General descriptions of the project area are provided below:

PHYSICAL SETTING	
Planning Area/ Community Name	Planning Area – Currently not located within Planning Area. Proposed – Brea 265 Specific Plan. Community Name – "Brea 265".
Location/Address	The Project is located within the central portion of the City of Brea and in unincorporated land within the City of Brea's Sphere of Influence and is located just northwest, southwest and southeast of the intersection of Lambert Road and Valencia Avenue.
Land Use	Existing: Vacant and Graded, Agriculture, Oil Extraction Proposed: Low, Medium and High Density Residential, Community Park and Open Space
Zoning	Existing: R-1 Single Family Residential (Areas west of Valencia) and None (Areas east of Valencia) Proposed: Master Planned Community/Brea 265 Specific Plan
Acreage	260.7 Acres
Predominant Soil Type	Hydrologic Soil Type C and D

III.2 SITE CHARACTERISTICS

The following table summarizes general characteristics of the project site:

SITE CHARACTERISTICS	
Precipitation Zone	0.90 in
Topography	The majority of the site is relatively flat with elevations gradually increasing in the north-eastern portions of the project. The majority of the site falls into the 0-10% slope range.
Drainage Patterns/Connections	In the pre-project condition, onsite drainage is divided into a Western Drainage and an Eastern Drainage. The Western Drainage consists of project areas west of Valencia Avenue and the Eastern Drainage consists of project areas east of Valencia Avenue. The Western Drainage totals approximately 96.4 acres and is divided into three sub-areas (A, B and C). Subarea Drainage "A" totals approximately 59.7 acres and consists of the eastern portion of the Western Drainage. A natural drainage traverses the drainage in a north to south direction. Runoff from areas north of Lambert Road is conveyed southerly toward Lambert Road and then centrally to the drainage. Similarly, runoff from the areas south of Lambert Road is primarily conveyed southerly to and then centrally prior to

SITE CHARACTERISTICS	
	discharging to the drainage. Runoff is then conveyed southerly through Brea Sports Park prior to discharging to the Loftus Diversion Channel, which is tributary to Fullerton Creek Channel, Coyote Creek Channel, the San Gabriel River and ultimately the Pacific Ocean. Subarea "B" totals approximately 20.7 acres and consists of the northwestern portion of the Western Drainage. Runoff is conveyed southerly to an existing v-ditch located on the northern side of Lambert Road and then westerly to an existing inlet prior to discharging to the existing storm drain line in Lambert Road. Runoff is then conveyed westerly and southerly prior to discharging to the Loftus Diversion Channel. Subarea "C" totals approximately 16.0 acres and consists of the western-central portion of the Western Drainage. Runoff is conveyed southwesterly to an existing drainage prior to discharging to the existing 60" storm drain line in an adjacent residential development to the west and conveyed southwesterly to the Loftus Channel. The Eastern Drainage totals approximately 183.8 acres and consists of the Eastern Project Area (south of Lambert Road and east of Valencia Avenue). Carbon Canyon Channel traverses the site in a southerly direction and divides the southeastern portion of the project site from the remaining portion of the Eastern Project Area (from Carbon Canyon Channel) to just east of the intersection of Rose Drive and Vesuvius Drive. Runoff from the larger northwestern portion of this drainage area is conveyed as sheet flow westerly to a system of paved and unpaved drainages and then southerly prior to discharging to the Carbon Canyon Channel. Runoff from the southeastern portion of this drainage area is conveyed as sheet flow and via an unimproved drainage to a low area located northwest of the intersection of Blake Road and Rose Drive, prior to discharging to the Carbon Canyon Channel to the west. All runoff is then conveyed southerly to the Santa Ana River (via the Carbon Canyon Diversion Channel) and then westerly to the Pacific Ocean.

SITE CHARACTERISTICS	
Soil Type, Geology, and Infiltration Properties	The site is located easterly of the Los Angeles Basin on the southwestern flank of the Puente Hills that form the western to northwestern margin of the Peninsular Ranges Geomorphic Province. The Puente Hills are bracketed by the Whittier and Chino Fault Zones and have been created by uplift along these faults. Approximately 13,000 feet of Miocene-aged marine clastic sedimentary rock underlies the Puente Hills. These sediments overlie approximately 16,000 feet of Tertiary aged rock, which are underlain by Mesozoic plutonic basement rocks. The site is underlain by Quaternary-aged alluvium and terrace deposits. Based on the County of Orange Technical Guidance Document (TGD) for Preparation of WQMPs and the geotechnical investigation, onsite soils consist primarily of Hydrologic Group C and D Soils, characterized as having slow to very slow infiltration rates when thoroughly wet. These soils are not favorable for infiltration. See WQMP Attachment D for soils information.
Hydrogeologic (Groundwater) Conditions	Project site is not located within a shallow groundwater zone, as defined by the TGD. Groundwater is expected to be greater than 10' below existing surface.
Geotechnical Conditions (relevant to infiltration)	Based on the TGD, majority of underlying soils consist primarily of Group "C" and "D" soils, which are not favorable for infiltration. Additionally, per the project's Focused Phase II Environmental Investigation[2], total petroleum hydrocarbons (TPH) have been identified in various locations throughout the project site. These locations have been identified in the exhibits provided in Attachment D. The contaminated soils will be removed, remediated and then placed throughout the project site at select locations. As such, infiltration has not been proposed for the project.
Off-Site Drainage	The project site receives run-on from upstream areas to the north. In the developed condition, storm water run-on from areas to the north will be conveyed through the project site via a separate onsite storm drain line (no comingling of onsite runoff) prior to discharging to pre-existing downstream connections.
Utility and Infrastructure Information	There are no major utilities currently on the project site. Wet and dry utilities are proposed for this project and will connect to existing facilities located in Valencia Avenue and Lambert Road.

[2] Northgate Environmental Management, Inc. May 10, 2017. *Focused Phase II Environmental Investigation. Brea 265 Property. Valencia Avenue at Lambert Road. Brea, California.*

III.3 WATERSHED DESCRIPTION

The following table provides descriptions of the project's receiving waters.

WATERSHED DESCRIPTION	
Receiving Waters	**San Gabriel River – Coyote Creek Watershed:** Loftus Diversion Channel (Facility A06), Fullerton Creek Channel (Facility A03), Coyote Creek Channel (Facility A01) **Santa Ana River Watershed:** Carbon Canyon Creek Channel (E03), Carbon Canyon Creek Diversion Channel (E02), Santa Ana River (E01) Reach 3, Santa Ana River (E01) Reach 2
303(d) Listed Impairments	**San Gabriel River – Coyote Creek Watershed:** Loftus Diversion Channel (Facility A06) – None Fullerton Creek Channel (Facility A03) – None Coyote Creek Channel (Facility A01) – Copper, Indicator Bacteria, Iron, Malathion, pH, Toxicity San Gabriel River Reach 1 – pH, Temperature San Gabriel River Estuary – Copper, Dioxin, Indicator Bacteria, Nickel, Dissolved Oxygen **Santa Ana River Watershed:** Carbon Canyon Creek Channel (E03) – None Carbon Canyon Creek Diversion Channel (E02) – None Santa Ana River (E01) Reach 3 – None Santa Ana River (E01) Reach 2 – None There is currently no approved WIHMP for either watershed.
Applicable TMDLs	**San Gabriel River – Coyote Creek Watershed:** Loftus Diversion Channel (Facility A06) – None Fullerton Creek Channel (Facility A03) – None Coyote Creek Channel (Facility A01) – *Copper*, *Indicator Bacteria* San Gabriel River Reach 1 – None San Gabriel River Estuary – *Copper*, *Indicator Bacteria* **Santa Ana River Watershed:** Carbon Canyon Creek Channel (E03) – None Carbon Canyon Creek Diversion Channel (E02) – None Santa Ana River (E01) Reach 3 – None Santa Ana River (E01) Reach 2 – None

WATERSHED DESCRIPTION	
Pollutants of Concern for the Project	Pollutants of Concern for the project include: Suspended Solids/Sediment, Nutrients, Metals, Pathogens, Pesticides, Oil & Grease, Toxic Organic Compounds and Trash & Debris. Primary Pollutants of Concern for the project include: Metals, Pathogens, Pesticides and Toxic Organic Compounds.
Environmentally Sensitive and Special Biological Significant Areas	The project site is not located within 200' of a 303(d) listed water body (which is defined as an Environmentally Sensitive Area (ESA) under Section 2.3.3.4 of the Technical Guidance Document).

SECTION IV BEST MANAGEMENT PRACTICES (BMPS)

IV. 1 PROJECT PERFORMANCE CRITERIA

The project's performance criteria for HCOCs and LID BMPs are provided in the following table:

PROJECT PERFORMANCE CRITERIA		
Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implanting LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	There is currently no approved WIHMP for the project's receiving waters.	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	Due to the increase in the project's post-development runoff volume and decrease in time to reach peak flows, hydromodification impacts are anticipated in the project's western drainage areas (west of Valencia Avenue), which discharges to the Loftus Channel. Project will implement hydromodification controls to address hydromodification impacts.	
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	• LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency. • LID BMPs must be designed to: - Retain, onsite, (infiltrate, harvest and use, or evapotranspire) stormwater runoff as feasible up to the Design Capture Volume, and - Recover (i.e., draw down) the storage volume as soon as possible after a storm event, and if necessary - **Biotreat, on-site, additional runoff, as feasible, up to 80 percent average annual capture efficiency (cumulative, retention plus biotreatment), and, if necessary** - Retain or biotreat, in a regional facility, the remaining runoff up to 80 percent annual capture efficiency (cumulative, retention plus biotreatment, onsite plus offsite), and, if necessary - Fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80 percent average annual capture efficiency using treatment controls or other alternative approaches as described in Section 7.II-3.	

PROJECT PERFORMANCE CRITERIA	
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Ocean Plan Trash Amendments – Full Capture System to trap particles 5mm or greater, and has a design treatment capacity that is either (the project's selected performance criteria is provided in bold): • **Equal to or greater than peak flow rate for the one-year, one-hour storm in the sub-drainage area; or** • Appropriately sized to, and designed to carry at least the same flows as, the corresponding storm drain.
Calculate LID design storm capture volume for Project.	See Section IV.2.2 for the project's required DCV for each of the project's Drainage Management Areas (DMA). In general, DCV = C x D x A x 43560 sf/ac x 1ft/12in Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) D = storm depth (inches) A = tributary area (acres)

IV.2 Site Design and Drainage Plan

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

IV.2.1 Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

Landscaping will be provided throughout the site, along project streets, within private lots as well as common lettered lots and recreation lot to minimize the amount of impervious area onsite.

Maximize Natural Infiltration Capacity

The project site consists primarily of HSG C and D soils, which are not feasible for infiltration. However, the project will utilize some retention of runoff in the project's landscaping areas to allow for some incidental infiltration and evapotranspiration processes. These areas include depressed parkways and landscaping areas.

Preserve Existing Drainage Patterns and Time of Concentration

In the developed condition, runoff from each of the project's development areas will be collected and discharged to the existing drainage downstream storm drain system. Changes in the time of concentration and peak flows from natural/pre-project conditions will be controlled via the project's hydromodification controls and detention facilities.

Disconnect Impervious Areas

Landscaping will be provided within the project's development areas to minimize the amount of directly connected impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

Project site will include natural conservation areas.

Revegetate Disturbed Areas and Xeriscape Landscaping

Native and/or tolerant landscaping will be incorporated into site design, consistent with City guidelines, in proposed landscaping areas.

IV.2.2 Drainage Management Areas (DMAs)

Per the TGD, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas tributary to the project's BMPs. DMA limits have been delineated based on the tributary drainage area for each BMP.

The design capture volume (DCV) utilizing the "Simple Method" described in TGD Section III.1.1 is provided below. Locations of DMAs and associated LID BMPs are provided on the exhibits in Section VI. Calculations and TGD Worksheets are provided in Appendix B of this WQMP.

DMA	Area (Ac.)	Imp.	C-value	Design Storm Depth (in)	DCV_{SIMPLE} (cu-ft)	Intensity (in/hr)	Q_{BMP} (cfs)
1	11.02	0.5	0.525	0.90	18,901.2	0.24	1.39
2	2.18	0.8	0.750	0.90	5,341.5	0.24	0.39
3	1.97	0.8	0.750	0.90	4,827.0	0.25	0.37
4	10.50	0.8	0.750	0.90	25,727.6	0.24	1.89
5	25.47	0.65	0.638	0.90	53,046.7	0.24	3.90
6	38.67	0.8	0.750	0.90	94,751.2	0.24	6.96
7	0.78	0.85	0.788	0.90	2,006.8	0.25	0.15
8	0.55	0.85	0.788	0.90	1,415.0	0.25	0.11
9	0.26	0.85	0.788	0.90	668.9	0.25	0.05
10	0.43	0.85	0.788	0.90	1,106.3	0.25	0.08
11	0.79	0.85	0.788	0.90	2,032.5	0.25	0.16
12	26.66	0.5	0.525	0.90	45,726.6	0.24	3.36
13	51.62	0.5	0.525	0.90	88,537.3	0.24	6.50
14	2.90	0.65	0.638	0.90	6,039.9	0.25	0.46
15	2.36	0.65	0.638	0.90	4,915.2	0.25	0.38
16	0.17	0.85	0.788	0.90	437.4	0.25	0.03
17	0.81	0.65	0.638	0.90	1,687.0	0.25	0.13
18	0.80	0.85	0.788	0.90	2,058.2	0.25	0.16
19	0.33	0.85	0.788	0.90	849.0	0.25	0.06
20	2.78	0.65	0.638	0.90	5,789.9	0.25	0.44
21	1.52	0.15	0.263	0.90	1,303.5	0.25	0.10
22	1.12	0.65	0.638	0.90	2,332.6	0.25	0.18
23	0.80	0.65	0.638	0.90	1,666.2	0.25	0.13

DMA	Area (Ac.)	Imp.	C-value	Design Storm Depth (in)	DCV_{SIMPLE} (cu-ft)	Intensity (in/hr)	Q_{BMP} (cfs)
24	1.44	0.65	0.638	0.90	2,999.1	0.25	0.23
25	3.21	0.65	0.638	0.90	6,685.5	0.25	0.51
26	1.53	0.5	0.525	0.90	2,624.2	0.25	0.20
27	2.30	0.65	0.638	0.90	4,790.2	0.25	0.37
28	0.18	0.85	0.788	0.90	463.1	0.25	0.04
29	2.07	0.65	0.638	0.90	4,311.2	0.25	0.33
30	1.88	0.65	0.638	0.90	3,915.5	0.25	0.30
31	0.49	0.5	0.525	0.90	840.4	0.25	0.06
32	1.40	0.5	0.525	0.90	2,401.2	0.25	0.18
33	0.67	0.8	0.750	0.90	1,641.7	0.25	0.13
34	3.66	0.5	0.525	0.90	6,277.5	0.25	0.48
35	0.63	0.5	0.525	0.90	1,080.6	0.25	0.08
36	9.86	0.5	0.525	0.90	16,911.6	0.24	1.24
37	1.64	0.65	0.638	0.90	3,415.6	0.25	0.26
38	1.43	0.65	0.638	0.90	2,978.3	0.25	0.23
39	2.83	0.65	0.638	0.90	5,894.1	0.25	0.45
40	1.59	0.65	0.638	0.90	3,311.5	0.25	0.25
41	20.12	0.8	0.750	0.90	49,299.0	0.24	3.62
42	0.82	0.65	0.638	0.90	1,707.8	0.25	0.13
43	0.56	0.65	0.638	0.90	1,166.3	0.25	0.09
Total	242.80	--	--	--	493,882.2	--	36.57

IV.3 LID BMP Selection and Project Conformance Analysis

Per the TGD, Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures in the following treatment hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

IV.3.1 Hydrologic Source Controls (HSC)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☒
Street trees (canopy interception)	☒
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐

Name	Included?
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐

HSC-2 Impervious Area Dispersion

Where feasible, runoff from the project's roof and walkway areas will be directed to adjacent landscaping areas for filtration, evapotranspiration and incidental infiltration of runoff and volume reduction, prior to discharging to the storm drain system.

HSC-3 Street Trees

Trees will be planted along the project's parkways and within common lot areas to intercept rainfall and provide some volume reduction benefits for the project.

At current, DCV reduction credits have not been determined for these areas as the project is in the planning phase of development. As such their benefits are incidental at the moment, as the areas have not been specifically designed to retain runoff.

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐

Due to the presence of unfavorable soil types (HSG Type C & D), the project's existing and past use for oil extraction and the presence of contaminated soils, BMPs that employ infiltration as the primary mechanism for pollutant removal are not feasible.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
EVAPOTRANSPIRATION	
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
HARVEST & REUSE/ RAINWATER HARVESTING	
Above-ground cisterns and basins	☐
Underground detention	☐

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in these BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

The project does not propose the use of harvesting BMPs, as harvesting runoff exclusively for landscape irrigation or toilet/urinal flushing was determined to be infeasible since the project's minimum required number of use (toilet flushing) or irrigation area for each harvesting BMP would exceed the project's estimated uses (See Worksheet J in Section IV.8).

Consideration was also given to harvesting runoff for multiples uses (both irrigation and toilet flushing). However, harvesting runoff for multiple uses was determined to be infeasible due to the difficulty in conveying harvested runoff from a focal collection point to each residential lot and also proposed irrigated landscaping areas (as opposed to high rise structures or cluster developments).

There is the possibility that harvest and use BMPs can be employed at a smaller scale in parks and landscaping areas. The feasibility of using harvest and use BMPs in these areas will be considered once project designs are more refined.

At the current phase of the project, biofiltration BMPs will be the primary LID BMPs employed to address low flow (irrigation and other non-storm water runoff) and storm water runoff from project areas.

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

BIOTREATMENT	
Name	Included?
Bioretention with underdrains	☒
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☒
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐

The project proposes the use of biotreatment BMPs to address the project's pollutants of concern from each of the project's DMAs. Anticipated BMPs within this category include bioretention (with underdrains) and proprietary biotreatment BMPs.

Bioretention BMPs will consist of traditional basin type bioretention (with underdrains) facilities. Each bioretention facility will be designed with a nutrient sensitive media, which would allow the units to provide a medium to high level of effectiveness at removing the project's storm water pollutants, as well as sub-drains to convey treated runoff to the storm drain system.

Proprietary biotreatment BMPs will be sized to address the water quality volume for its tributary area and designed with volume-based (with the BMP system equipped with a subsurface detention facility to capture DCV, then discharges through a proprietary biotreatment BMP unit) or flow-based (runoff is conveyed directly to proprietary biofiltration BMP unit, or media area within open basin) configurations. These BMPs have been selected based on their proven pollutant removal efficiencies, as well as site constraints from proposed land use areas.

BIOTREATMENT BMP DESIGN SUMMARY							
DMA	DCV_{SIMPLE} (cu-ft)	Q_{BMP} (cfs)	BMP Alternatives	DCV_{BMP} Footprint Required (sf)[1]	Q_{BMP} Footprint Required (sf)[2]	BMP Footprint / Model Provided[4]	BMP Lat/Long (DD)
1	18,901.2	1.39	BIORETENTION WITH UNDERDRAINS, PROPRIETARY BIOFILTRATION	12,600.8	514.3	TBD	33.924254°, -117.855139°
2	5,341.5	0.39	PROPRIETARY BIOFILTRATION	--	145.3		33.923916°, -117.854935°
3	4,827.0	0.37	PROPRIETARY BIOFILTRATION	--	136.8		33.923653°, -117.855158°
4	25,727.6	1.89	SUBSURFACE VAULT WITH PROPRIETARY BIOFILTRATION	212.3[3]	700.0		33.921623°, -117.855028°
5	53,046.7	3.90	SUBSURFACE VAULT WITH PROPRIETARY BIOFILTRATION	438.5[3]	1,443.3		33.920827°, -117.853190°
6	94,751.2	6.96	BASIN WITH PROPRIETARY BIOFILTRATION	--	2,578.0		33.921744°, -117.848148°
7	2,006.8	0.15	PROPRIETARY BIOFILTRATION	--	56.9		33.920916°, -117.849499°
8	1,415.0	0.11	PROPRIETARY BIOFILTRATION	--	40.1		33.920925°, -117.848871°
9	668.9	0.05	PROPRIETARY BIOFILTRATION	--	19.0		33.920938°, -117.849103°
10	1,106.3	0.08	PROPRIETARY BIOFILTRATION	--	31.4		33.920767°, -117.848812°
11	2,032.5	0.16	PROPRIETARY BIOFILTRATION	--	57.6		33.920583°, -117.849500°
12	45,726.6	3.36	BASIN WITH PROPRIETARY BIOFILTRATION	--	1,244.1		33.918872°, -117.846523°
13	88,537.3	6.50	BASIN WITH PROPRIETARY BIOFILTRATION	--	2,408.9		33.917689°, -117.843665°
14	6,039.9	0.46	PROPRIETARY BIOFILTRATION	--	171.2		33.920493°, -117.844312°
15	4,915.2	0.38	PROPRIETARY BIOFILTRATION	--	139.3	TBD	33.919762°, -117.844664°
16	437.4	0.03	PROPRIETARY BIOFILTRATION	--	12.4		33.920379°, -117.844259°
17	1,687.0	0.13	PROPRIETARY BIOFILTRATION	--	47.8		33.919787°, -117.844519°
18	2,058.2	0.16	PROPRIETARY BIOFILTRATION	--	58.3		33.918866°, -117.845760°
19	849.0	0.06	PROPRIETARY BIOFILTRATION	--	24.1		33.917973°, -117.845404°
20	5,789.9	0.44	PROPRIETARY BIOFILTRATION	--	164.1		33.918001°, -117.844839°
21	1,303.5	0.10	BIORETENTION WITH UNDERDRAINS OR PROPRIETARY BIOFILTRATION	869.0	36.9		33.918509°, -117.847218°
22	2,332.6	0.18	PROPRIETARY BIOFILTRATION	--	66.1		33.918768°, -117.845933°
23	1,666.2	0.13	PROPRIETARY BIOFILTRATION	--	47.2		33.918640°, -117.845912°

BIOTREATMENT BMP DESIGN SUMMARY							
DMA	DCV_{SIMPLE} (cu-ft)	Q_{BMP} (cfs)	BMP Alternatives	DCV_{BMP} Footprint Required (sf)[1]	Q_{BMP} Footprint Required (sf)[2]	BMP Footprint / Model Provided[4]	BMP Lat/Long (DD)
24	2,999.1	0.23	PROPRIETARY BIOFILTRATION	--	85.0		33.917997°, -117.844700°
25	6,685.5	0.51	PROPRIETARY BIOFILTRATION	--	189.5		33.916719°, -117.843678°
26	2,624.2	0.20	PROPRIETARY BIOFILTRATION	--	74.4		33.917258°, -117.846184°
27	4,790.2	0.37	PROPRIETARY BIOFILTRATION	--	135.8		33.916950°, -117.845525°
28	463.1	0.04	PROPRIETARY BIOFILTRATION	--	13.1		33.917909°, -117.845307°
29	4,311.2	0.33	PROPRIETARY BIOFILTRATION	--	122.2		33.917098°, -117.844647°
30	3,915.5	0.30	PROPRIETARY BIOFILTRATION	--	111.0		33.917036°, -117.844737°
31	840.4	0.06	PROPRIETARY BIOFILTRATION	--	23.8		33.916571°, -117.846040°
32	2,401.2	0.18	PROPRIETARY BIOFILTRATION	--	68.1		33.916620°, -117.845238°
33	1,641.7	0.13	PROPRIETARY BIOFILTRATION	--	46.5		33.916262°, -117.844855°
34	6,277.5	0.48	PROPRIETARY BIOFILTRATION	--	177.9	TBD	33.916362°, -117.846010°
35	1,080.6	0.08	PROPRIETARY BIOFILTRATION	--	30.6		33.916532°, -117.845430°
36	16,911.6	1.24	BASIN WITH PROPRIETARY BIOFILTRATION	--	460.1		33.914622°, -117.845790°
37	3,415.6	0.26	PROPRIETARY BIOFILTRATION	--	96.8		33.915952°, -117.845023°
38	2,978.3	0.23	PROPRIETARY BIOFILTRATION	--	84.4		33.915748°, -117.845071°
39	5,894.1	0.45	PROPRIETARY BIOFILTRATION	--	167.0		33.915290°, -117.845078°
40	3,311.5	0.25	PROPRIETARY BIOFILTRATION	--	93.9		33.915045°, -117.845026°
41	49,299.0	3.62	BASIN WITH PROPRIETARY BIOFILTRATION	--	1,341.3		33.910692°, -117.842110°
42	1,707.8	0.13	PROPRIETARY BIOFILTRATION	--	48.4		33.911667°, -117.843064°
43	1,166.3	0.09	PROPRIETARY BIOFILTRATION	--	33.1		33.910768°, -117.842439°

[1] Based on 1.5' ponding depth.
[2] Based on 0.0027 cfs (1.0 gpm) per sf of proprietary media for flow-based BMPs. This is the typical media flow rate for systems such as Filterra, Focal Point and Modular Wetland System (MWS) units.
[3] Based on 0.0007 cfs (0.26 gpm) per sf of proprietary media with 48 hour draw down. This is based on MWS units configured for volume-based treatment approach.
[4] Minimum footprint for each BMP will be provided in each DMA. Actual manufacturer / model or footprint to be determined.

IV.3.5 Hydromodification Control BMPs

The project is subject to hydromodification. The following BMP will be employed to address project impacts.

<table>
<tr><th colspan="2">HYDROMODIFICATION CONTROL BMPS</th></tr>
<tr><th>BMP Name</th><th>BMP Description</th></tr>
<tr><td>Detention Facilities</td><td>2 subsurface detention vaults and 2 biofiltration basin BMPs located in the project's Western Drainage will be employed to detain the difference in runoff for the 2-year event and larger storms as needed. Sizing of the proposed facilities will be provided to detain the required volume increases provided in Section II.3
• Sub-Drainage Area "A" (DMAs 5 through 11) – 6.15 ac-ft – Required detention volume will be addressed via a subsurface detention vault located beneath a parking lot located in the western southwestern portion of this drainage area and an open proprietary biofiltration basin located in the eastern portion of this sub-drainage area. The vault will provide 3.3 acre-feet of storage (in addition to storage for DCV). The basin will provide 2.85 acre-feet of storage.
• Sub-Drainage Area "B" (DMAs 1 through 3) – 0.92 ac-ft – Required detention volume will be addressed via a bioretention with underdrains facility located at the southwestern portion of this sub-drainage area.
• Sub-Drainage Area "C" (DMA 4) – 0.85 ac-ft – Required detention volume will be addressed via a subsurface detention vault located in the western portion of this sub-drainage area.
Hydromodification Summary Table
<table>
<tr><th>Sub-Drainage</th><th>Detention BMP</th><th>Size</th><th>Total Storage Provided (ac-ft)</th></tr>
<tr><td rowspan="2">A</td><td rowspan="2">Vault & Basin</td><td>Vault: 23,097 ft^2 X 8.6'</td><td>4.52[1]</td></tr>
<tr><td>Basin: 2,977 ft^2 X 8'</td><td>2.85</td></tr>
<tr><td>B</td><td>Basin</td><td>17,123 ft^2 X 4'</td><td>1.57[1]</td></tr>
<tr><td>C</td><td>Vault</td><td>13,689 ft^2 X 4.6'</td><td>1.46[1]</td></tr>
</table>
[1] Includes storage volume for DCV</td></tr>
</table>

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable to project. Project is not part of any regional or sub-regional BMP programs. Project will employ use of onsite LID BMPs to address project runoff.

IV.3.7 Treatment Control BMPs

The project is able to meet LID requirements onsite. Treatment control BMPs for this project applies to the treatment BMP employed to meet current full trash capture requirements per the Ocean Plan.

To address this requirement, the project proposes the use of connector pipe screens in project

catch basins and/or hydrodynamic separators that have been approved by the SWRCB and meet the sizing requirement for Full Trash Capture BMPs per the Ocean Plan (Equal to or greater than peak flow rate for the one-year, one-hour storm in the sub-drainage area).

Source Control BMPs

In accordance with the County DAMP and City of Brea Local Implementation Plan (LIP), both structural and non-structural source control BMPs are required for all priority projects unless deemed not applicable based on project characteristics. The following tables summarize the source control BMPs (Non-Structural and Structural) specified in the County DAMP and City's LIP.

The following tables show source control BMPs (routine non-structural and routine structural) included in this project and those that were not included.

IV.3.8 Non-Structural Source Control BMPs

The table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Additional discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

NON-STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR compliance.
N6	Local Industrial Permit Compliance	☐	☒	Project is not subject to industrial permit.
N7	Spill Contingency Plan	☐	☒	Proposed facility will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks proposed for the project.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed facility will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☐	☒	Proposed facility does not propose to store toxic or highly toxic compressed gases.

NON-STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	Not in project scope.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Public Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Not in project scope.

N1 – Education for Property Owners

Educational materials will be provided to homeowners at close of escrow by owner/developer and periodically thereafter by the HOA to inform them of their actions and the potential impacts to downstream water quality. Materials include those described in Section VII of this WQMP and any updates to educational materials.

N2 – Activity Restrictions

Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measure.

N3 – Common Area Landscape Management

Maintenance activities for landscape areas shall be consistent with City and manufacturer guidelines for fertilizer and pesticide use (OC DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement and shall be consistent with the City's Landscape Ordinance. Stockpiled materials during maintenance activities shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled.

N4 – BMP Maintenance

The project proponent shall be responsible for implementation of each applicable non-structural, structural and LID BMPs as well as scheduling inspection and maintenance cleaning of all applicable structural BMP facilities. The proponent shall be responsible for inspection and maintenance activities in landscape areas (see WQMP Site Plan).

N11 – Common Area Litter Control

Litter control onsite will include the use of litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.

N12 – Employee Training

All employees and any contractors 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 limited to, spoil clean up procedures, proper waste disposal, housekeeping practices, etc.

N14 – Common Area Catch Basin Inspection

As required by the TGD, at least 80% of all drainage facilities shall be inspected each year and, if necessary, cleaned and maintained prior to the storm season, no later than October 15th each year; with 100% of all drainage facilities inspected, cleaned and maintained within a two year period. Drainage facilities include catch basins and inlets, detention vaults and the project's LID BMPs.

N15 – Street Sweeping Public Streets and Parking Lots

All project streets shall be vacuum swept on a weekly basis, consistent with City's sweeping schedule.

Refer to Section V for implementation frequency and maintenance responsibilities.

IV.3.9 Structural Source Control BMPs

The source control BMPs have been selected in the following table to address the anticipated pollutants generated by the proposed project. These BMPs are designed to work in conjunction with the project's LID BMPs to minimize potential impacts to the site's receiving waters.

STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor storage areas proposed for park.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	Not applicable to project area.
S6	Dock areas	☐	☒	
S7	Maintenance bays	☐	☒	No maintenance bays proposed for project.

STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S8	Vehicle wash areas	☐	☒	No vehicle washing allowed onsite.
S9	Outdoor processing areas	☐	☒	No outdoor processing of goods required for project.
S10	Equipment wash areas	☐	☒	No wash areas onsite.
S11	Fueling areas	☐	☒	No fueling areas in project scope.
S12	Hillside landscaping	☐	☒	Project is not hillside development with large slopes.
S13	Wash water control for food preparation areas	☐	☒	
S14	Community car wash racks	☐	☒	Not in project scope.

S1 – Provide Storm Drain System Stenciling and Signage (CASQA SD-13)

Storm drain stenciling with a brief message or graphical icons with symbols, prohibiting the dumping of improper materials into the storm drain system shall be placed in highly visible areas adjacent to all storm drain inlets. The BMP is designed to alert and educate homeowners and guests of the destination of pollutants discharged into storm drain systems. Legibility of stencils and signs shall be maintained.

S3 – Trash Enclosure (CASQA SD-32)

All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards. Trash enclosure locations are not known at this time. Locations will be identified as project designs approach final.

S4 – Efficient Irrigation System & Landscape Design (CASQA SD-10 & SD-12)

Landscaping will be designed to consist of native species or drought tolerant, water conserving landscaping. Irrigation system will be designed, constructed and adjusted to eliminate overspray to hardscape areas, with timing and cycle lengths adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.

S5 – Project Slopes and Channels and Provide Energy Dissipation

The project's landscaped slopes shall be inspected for adequate vegetation cover, vegetation health and signs of erosion. Dead or dying vegetation shall be replaced as needed. Signs of erosion and concentrated flow areas shall be noted and repaired as needed.

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

The project is able to fully address the design capture volume via onsite LID BMPs. Therefore, an alternative compliance plan is not applicable to this project.

IV.4.1 Water Quality Credits

Not applicable to project. Project will utilize LID BMPs onsite to address storm water.

<table>
<tr><th colspan="5">DESCRIPTION OF PROPOSED PROJECT</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td>☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits (if applicable)</td><td colspan="4">N/A</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

Not applicable to project. Project will utilize LID BMPs onsite to address storm water pollutants.

SECTION V INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPS

It has been determined that the Owner shall assume all BMP funding, inspection and maintenance responsibilities for the Brea 265 project, until such time, site ownership, maintenance and funding responsibilities have been transferred to the HOA and the City of Brea, as appropriate.

Contact/Title _____

Company Aera Energy LLC.

Address 3030 Saturn Street, Suite 101
Brea, CA 92821

Email _____

Telephone # (714) 577-9154

The Owner shall verify BMP implementation and ongoing maintenance through inspection, self-certification or other equally effective measure. The certification shall verify that the inspection and maintenance of all BMPs are performed in accordance to the requirements of this WQMP.

The BMP Inspection and Maintenance Responsibility Matrix is provided in the following table. An Operations and Maintenance (O&M) Plan is also included as an attachment to this WQMP.

BMP INSPECTION/MAINTENANCE			
BMP	**Responsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
HYDROLOGIC SOURCE CONTROL BMPs			
HSC-2 Impervious Area Dispersion	Owner/HOA	Inspect for standing water and that water infiltrates into underlying soil completely. Remove accumulated sediment or repair eroded areas as needed.	After qualifying storm events of 0.5" or greater and monthly with landscaping maintenance
HSC-3 Street Trees	Owner/HOA	Conduct general inspection and maintenance monthly per routine landscaping maintenance activities. Trim trees as needed. Conduct bi-annual tree health evaluations.	After qualifying storm events of 0.5" or greater and monthly with landscaping maintenance

BMP INSPECTION/MAINTENANCE			
BMP	**Responsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
BIOTREATMENT BMPs			
BIO-1 Bioretention with Underdrains	Owner/HOA	Conduct general inspection and maintenance per routine landscaping maintenance activities. Inspect surface area for debris, trash and vegetation accumulation. Inspect for general plant health. Inspect for sediment, build up on planting surface and in area drain inlet. Inspect for sediment or debris clogging inlet. Clean/repair items as necessary.	Monthly
		Remove vegetation, permeable soil and drain rock. Replace in kind. Check sub-drain pipe and inlet. Repair if necessary.	Every 5 to 7 years
BIO-7 Proprietary Biotreatment (includes Basins with proprietary media)	Owner/HOA	Inspect unit for accumulated debris and sediment and plant health; remove trash from screening device and separation chamber; trim vegetation. Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media. Replace wetland media.	Annually 20 years
DETENTION BMP			
Detention Basin or Vault	Owner/HOA	Inspect for standing water and that water is discharged to the downstream storm drain system completely in no greater than 72 hours. Inspect and remove accumulated sediment and debris in settling chamber (first few modules of system).	Storms exceeding 2-year event (greater than 2" within 24 hours), semi-annual
GROSS SOLIDS REMOVAL BMPs			
PRE-1 Gross Solids Removal Devices (Connector Pipe Screens)	Owner/HOA	Inspect unit for accumulated debris and sediment. Remove when accumulated material reaches ½ height of screen.	Inspect monthly and after significant storm events. Clean annually and as needed.

BMP INSPECTION/MAINTENANCE			
BMP	**Responsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
PRE-1 Gross Solids Removal Devices (Hydrodynamic Separation Device)	Owner/HOA	Inspect prior to and after traditional rainy season. Inspect for accumulated debris, trash and oil/grease accumulation; remove (vactor truck) accumulated debris when system reaches 75% of capacity and as needed based on site activities (e.g. spills, leaks, etc.).	Semi-annual (Spring and Fall)
NON-STRUCTURAL SOURCE CONTROL BMPs			
N1 Education for Property Owners, Tenants and Occupants	Owner/HOA	Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those shown in Section VII of this WQMP.	At close of escrow and Annually
N2 Activity Restrictions	Owner/HOA	Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the HOA. The HOA shall be responsible for ensuring residents compliance.	Ongoing
N3 Common Area Landscape Management	Owner/HOA	Maintenance shall be consistent with City requirements; any fertilizer and/or pesticide usages shall be consistent with City and manufacturer guidelines for use of fertilizers and pesticides. Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly and as needed

BMP INSPECTION/MAINTENANCE			
BMP	**Responsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N4 BMP Maintenance	Owner/HOA	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 City and documented with the WQMP.	Ongoing
N11 Common Area Litter control	Owner/HOA	Litter patrol, violations investigation, reporting and other litter control activities shall be performed by the owner/HOA as needed and in conjunction with maintenance activities for common areas.	Ongoing
N12 Employee Training	Owner/HOA	All employees and any contractors 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 limited to, spoil clean up procedures, proper waste disposal, housekeeping practices, etc.	Upon hire and annually thereafter
N14 Common Area Catch Basin Inspection	Owner/HOA and City, as appropriate	Catch basin inlets, area drains, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of private facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained within a 2-year period.	Annually
N15 Street Sweeping	Owner/HOA and City, as appropriate	Project streets and parking areas shall be vacuum swept at a minimum, weekly basis, consistent with City schedules.	Weekly

BMP INSPECTION/MAINTENANCE			
BMP	**Responsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
STRUCTURAL SOURCE CONTROL BMPs			
S1 Provide storm drain system stencilling and signage	Owner/HOA and City, as appropriate	As a part of the Preliminary civil engineering drawings, it will be required by the Developer to stencil on all of the project's catch basins, where applicable in paved areas, the words, "No Dumping - Drains to Ocean." Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually
S3 Trash Enclosure	Owner/HOA	All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards. Trash enclosure locations are not known at this time. Locations will be identified as project designs approach final.	Daily
S4 Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Owner/HOA	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, day or night time temperatures based on system specifications and local climate patterns.	Monthly

BMP INSPECTION/MAINTENANCE			
BMP	Responsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
S5 – Project Slopes and Channels	Owner/HOA	Lined concrete drains and down drains will be constructed on slope areas to convey runoff safely from top of slopes and to prevent storm and irrigation runoff from discharging in an uncontrolled manner, thereby causing erosion. Runoff from the slope areas will be conveyed to either the storm drain system or to outlet dissipation devices to prevent scouring and erosion. All slope areas will have at least 70% vegetative cover consisting of native and/or drought tolerant plant species with a deep root system. These areas will be inspected on a monthly basis for signs of erosion and plant health.	Monthly
S12 – Hillside Landscaping	Owner/HOA	Hillside areas that are disturbed by project development shall be landscaped with deep-rooted, drought tolerant plant species selected for erosion control and consistent with County of Orange requirements and City of San Juan Capistrano requirements. Areas shall be inspected per guidelines provided in N3.	Monthly

SECTION VI SITE PLAN AND DRAINAGE PLAN

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 LID BMPs are shown as well.

Exhibits

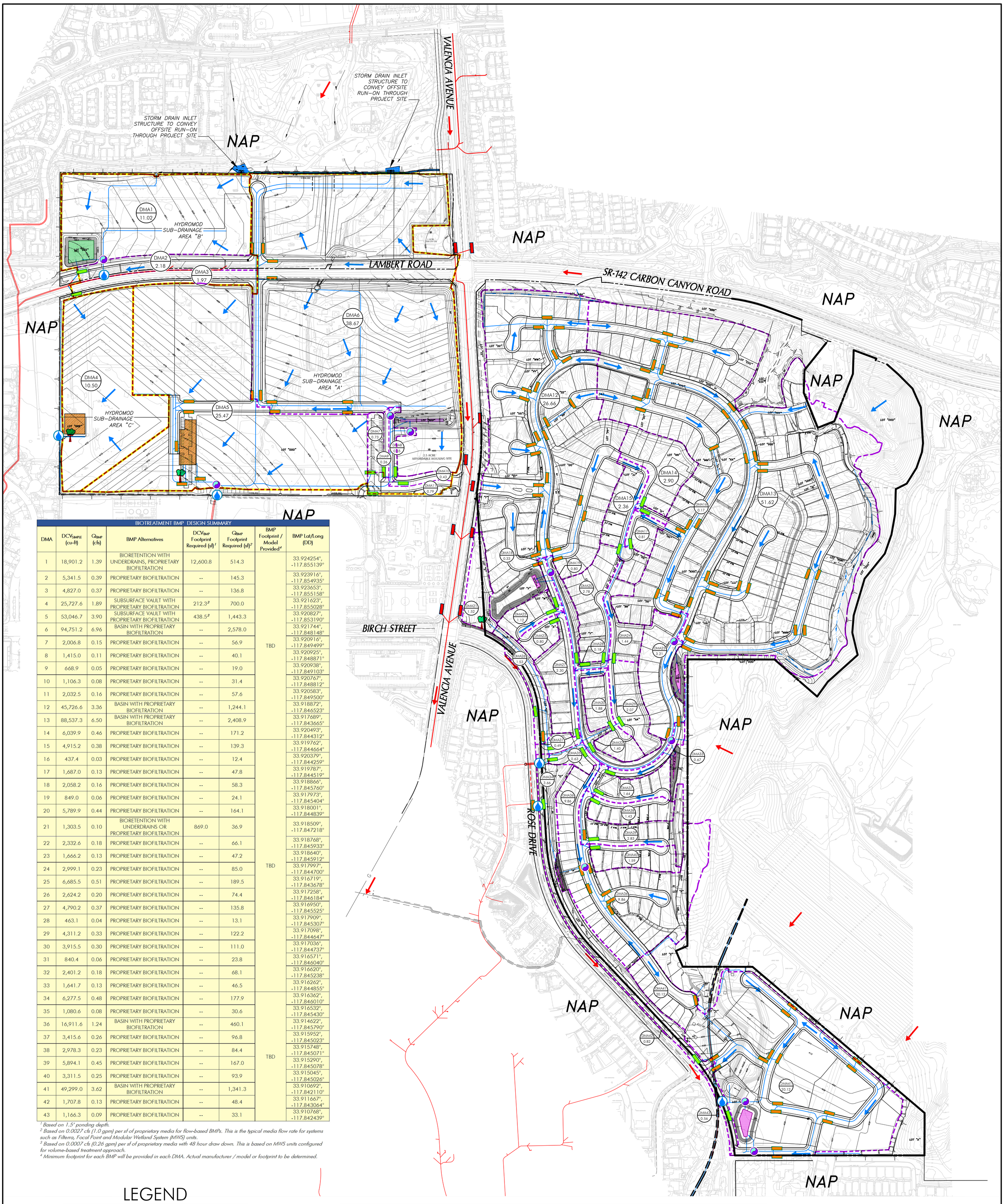
- Vicinity Map
- WQMP Site Plan Exhibit

BREA 265

SCALE: 1" = 2000'

DRAWN BY: TIH	PREPARED BY: HUNSAKER & ASSOCIATES IRVINE, INC. PLANNING ■ ENGINEERING ■ SURVEYING Three Hughes, Irvine, CA 92618 ■ PH: (949) 583-1010 ■ FX: (949) 583-0759	PREPARED FOR: CAERA 3030 SATURN STREET, SUITE 101 BREA, CA 92821 (714) 577-9147	"BREA 265" SOUTH OF LAMBERT ROAD AND VALENCIA AVENUE CITY OF BREA, CA	WQMP VICINITY MAP
DATE: 03/08/2019				
W.O.: 2256-17X				

DATE: Mar. 19, 2019 01:10:16 PM FILE: F:\0477\Planning\SY_WQ\PWQMP\Exhibits\PWQMP_VIC Brea 265.dwg

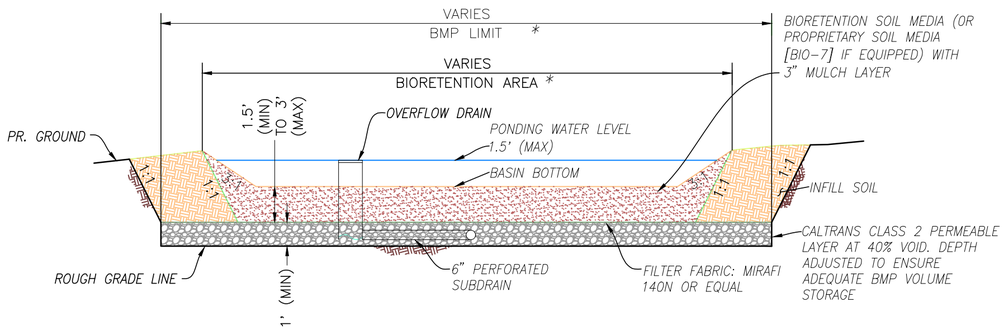


BIOTREATMENT BMP DESIGN SUMMARY							
DMA	DCV_{SIMPLE} (cu-ft)	Q_{BMP} (cfs)	BMP Alternatives	DCV_{BMP} Footprint Required (sf)[1]	Q_{BMP} Footprint Required (sf)[2]	BMP Footprint / Model Provided[4]	BMP Lat/Long (DD)
1	18,901.2	1.39	BIORETENTION WITH UNDERDRAINS, PROPRIETARY BIOFILTRATION	12,600.8	514.3	TBD	33.924254°, -117.855139°
2	5,341.5	0.39	PROPRIETARY BIOFILTRATION	--	145.3		33.923916°, -117.854935°
3	4,827.0	0.37	PROPRIETARY BIOFILTRATION	--	136.8		33.923653°, -117.855158°
4	25,727.6	1.89	SUBSURFACE VAULT WITH PROPRIETARY BIOFILTRATION	212.3[3]	700.0		33.921623°, -117.855028°
5	53,046.7	3.90	SUBSURFACE VAULT WITH PROPRIETARY BIOFILTRATION	438.5[3]	1,443.3		33.920827°, -117.853190°
6	94,751.2	6.96	BASIN WITH PROPRIETARY BIOFILTRATION	--	2,578.0		33.921744°, -117.848148°
7	2,006.8	0.15	PROPRIETARY BIOFILTRATION	--	56.9		33.920916°, -117.849499°
8	1,415.0	0.11	PROPRIETARY BIOFILTRATION	--	40.1		33.920925°, -117.848871°
9	668.9	0.05	PROPRIETARY BIOFILTRATION	--	19.0		33.920938°, -117.849103°
10	1,106.3	0.08	PROPRIETARY BIOFILTRATION	--	31.4		33.920767°, -117.848812°
11	2,032.5	0.16	PROPRIETARY BIOFILTRATION	--	57.6		33.920583°, -117.849500°
12	45,726.6	3.36	BASIN WITH PROPRIETARY BIOFILTRATION	--	1,244.1		33.918872°, -117.846523°
13	88,537.3	6.50	BASIN WITH PROPRIETARY BIOFILTRATION	--	2,408.9		33.917689°, -117.843665°
14	6,039.9	0.46	PROPRIETARY BIOFILTRATION	--	171.2		33.920493°, -117.844312°
15	4,915.2	0.38	PROPRIETARY BIOFILTRATION	--	139.3	TBD	33.919762°, -117.844664°
16	437.4	0.03	PROPRIETARY BIOFILTRATION	--	12.4		33.920379°, -117.844259°
17	1,687.0	0.13	PROPRIETARY BIOFILTRATION	--	47.8		33.919787°, -117.844519°
18	2,058.2	0.16	PROPRIETARY BIOFILTRATION	--	58.3		33.918866°, -117.845760°
19	849.0	0.06	PROPRIETARY BIOFILTRATION	--	24.1		33.917973°, -117.845404°
20	5,789.9	0.44	PROPRIETARY BIOFILTRATION	--	164.1		33.918001°, -117.844839°
21	1,303.5	0.10	BIORETENTION WITH UNDERDRAINS OR PROPRIETARY BIOFILTRATION	869.0	36.9		33.918509°, -117.847218°
22	2,332.6	0.18	PROPRIETARY BIOFILTRATION	--	66.1		33.918768°, -117.845933°
23	1,666.2	0.13	PROPRIETARY BIOFILTRATION	--	47.2		33.918640°, -117.845912°
24	2,999.1	0.23	PROPRIETARY BIOFILTRATION	--	85.0		33.917997°, -117.844700°
25	6,685.5	0.51	PROPRIETARY BIOFILTRATION	--	189.5		33.916719°, -117.843678°
26	2,624.2	0.20	PROPRIETARY BIOFILTRATION	--	74.4		33.917258°, -117.846184°
27	4,790.2	0.37	PROPRIETARY BIOFILTRATION	--	135.8		33.916950°, -117.845525°
28	463.1	0.04	PROPRIETARY BIOFILTRATION	--	13.1		33.917909°, -117.845307°
29	4,311.2	0.33	PROPRIETARY BIOFILTRATION	--	122.2		33.917098°, -117.844647°
30	3,915.5	0.30	PROPRIETARY BIOFILTRATION	--	111.0		33.917036°, -117.844737°
31	840.4	0.06	PROPRIETARY BIOFILTRATION	--	23.8		33.916571°, -117.846040°
32	2,401.2	0.18	PROPRIETARY BIOFILTRATION	--	68.1		33.916620°, -117.845238°
33	1,641.7	0.13	PROPRIETARY BIOFILTRATION	--	46.5		33.916262°, -117.844855°
34	6,277.5	0.48	PROPRIETARY BIOFILTRATION	--	177.9	TBD	33.916362°, -117.846010°
35	1,080.6	0.08	PROPRIETARY BIOFILTRATION	--	30.6		33.916532°, -117.845430°
36	16,911.6	1.24	BASIN WITH PROPRIETARY BIOFILTRATION	--	460.1		33.914622°, -117.845790°
37	3,415.6	0.26	PROPRIETARY BIOFILTRATION	--	96.8		33.915952°, -117.845023°
38	2,978.3	0.23	PROPRIETARY BIOFILTRATION	--	84.4		33.915748°, -117.845071°
39	5,894.1	0.45	PROPRIETARY BIOFILTRATION	--	167.0		33.915290°, -117.845078°
40	3,311.5	0.25	PROPRIETARY BIOFILTRATION	--	93.9		33.915045°, -117.845026°
41	49,299.0	3.62	BASIN WITH PROPRIETARY BIOFILTRATION	--	1,341.3		33.910692°, -117.842110°
42	1,707.8	0.13	PROPRIETARY BIOFILTRATION	--	48.4		33.911667°, -117.843064°
43	1,166.3	0.09	PROPRIETARY BIOFILTRATION	--	33.1		33.910768°, -117.842439°

[1] *Based on 1.5' ponding depth.*
[2] *Based on 0.0027 cfs (1.0 gpm) per sf of proprietary media for flow-based BMPs. This is the typical media flow rate for systems such as Filterra, Focal Point and Modular Wetland System (MWS) units.*
[3] *Based on 0.0007 cfs (0.26 gpm) per sf of proprietary media with 48 hour draw down. This is based on MWS units configured for volume-based treatment approach.*
[4] *Minimum footprint for each BMP will be provided in each DMA. Actual manufacturer / model or footprint to be determined.*

LEGEND

- PROJECT LIMITS
- NAP — NOT A PART
- SUBDRAINAGE BOUNDARY (HYDROMODIFICATION AREAS)
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- DMA / ACRE — DMA DESIGNATION AND ACRES
- DMA DESIGNATION AND ACRES
- DMA DESIGNATION AND ACRES
- PROJECT STORM DRAIN SYSTEM (PRIVATE)
- EXISTING/OFFSITE STORM DRAIN SYSTEM (PUBLIC)
- PROJECT CATCH BASIN WITH BMP (PRIVATE) S1 STORM DRAIN SYSTEM STENCILING/SIGNAGE
- PROJECT CATCH BASIN WITH BMPS (PRIVATE) S1 STORM DRAIN SYSTEM STENCILING/SIGNAGE BIO-7 PROPRIETARY BIOFILTRATION (BIOTREATMENT)
- EXISTING/OFFSITE CATCH BASIN (PUBLIC)
- WATER QUALITY DIVERSION STRUCTURE (PRIVATE) INCLUDES 2-YEAR STORM FOR WESTERN PROJECT AREA
- BIO-7 PROPRIETARY BIOFILTRATION (PRIVATE)
- BIO-7 BASIN WITH PROPRIETARY BIOFILTRATION MEDIA (PRIVATE)
- BIO-7 BASIN WITH PROPRIETARY BIOFILTRATION MEDIA (PRIVATE) ALSO FOR HYDROMODIFICATION CONTROL
- BIO-1 BIORETENTION WITH UNDERDRAIN (PRIVATE) ALSO FOR HYDROMODIFICATION CONTROL
- SUBSURFACE DETENTION FACILITY (PRIVATE) FOR WATER QUALITY AND HYDROMODIFICATION CONTROL
- DISCHARGE POINT



BIO-1 BIORETENTION WITH UNDERDRAIN & BIO-7 PROPRIETARY BIOTREATMENT (BASIN TYPE)
N.T.S.
TYPICAL SECTION DETAIL

N

GRAPHIC SCALE
0 125 250 500
(IN FEET)
1 INCH = 250 FT.

PRELIMINARY/CONCEPTUAL DRAFT WATER QUALITY MANAGEMENT PLAN - SITE PLAN

APPLICANT:
AERA
3030 SATURN STREET, SUITE 101
BREA, CA 92821
(714) 577-9147

PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

"BREA 265"
SOUTH OF LAMBERT ROAD
AND VALENCIA AVENUE
CITY OF BREA, COUNTY OF ORANGE, CALIFORNIA

DRAFTED BY:	DATE:	W.O. NO:	SHEET NO:
TIH	02/11/2022	4213-3	1 OF 1

DATE: Feb. 11, 2022 01:30:46 PM FILE: F:\0477\Planning\SY_WQ\PWQMP\Exhibits\PWQMP_SP Brea 265.dwg

SECTION VII EDUCATIONAL MATERIALS INCLUDED

The following table contains a list of applicable educational materials to be included in the project's Final WQMP.

EDUCATION MATERIALS			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☒		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☒		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☒		☐
Tips for Projects Using Paint	☒		☐

Attachment A – Educational Materials

(Provided at Final WQMP)

Attachment B – BMP Worksheets, Calculations & BMP Details

BIO-1 – Bioretention with Underdrains

BIO-7 Proprietary Biotreatment

Proprietary Biotreatment Alternatives (Focal Point, Filterra, Modular Wetlands)

BMP Worksheets and Calculations

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.	X	
Provide basis: Site's current and previous use for oil extraction and presence of oil at depth			
2	Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert):		X
Provide basis: Per TGD Maps, site consists primarily of C and D soils.			
3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X
Provide basis: Per County TGD Maps, no restrictions on infiltration due to water rights.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	X	
Provide basis: Based on TGD maps, majority of site contains HSG D and C soils.			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in Appendix VII.	Not available	Not available
Provide basis: Not known. Percolation test were not conducted onsite.			
6	Would **reduction of over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Project discharges to storm channel that is not ephemeral.			
7	Would **an increase in infiltration over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Based on TGD and County GIS records, no restrictions on infiltration due to ephemeral washes or groundwater concerns.			

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII)? Provide narrative discussion and supporting evidence: Per TGD and County of Orange GIS data, project is not located in an area where increase in I&I to the sanitary sewer is of concern.	No
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis: Item 1 is yes. Due to site's current and past use for oil extraction, there is potential for contamination of groundwater due to infiltration.	Item 1 is yes.
10	If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis:	
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	

Worksheet J: Summary of Harvested Water Demand and Feasibility – Overall Project Site

1	What demands for harvested water exist in the tributary area (check all that apply):			
2	Toilet and urinal flushing		☒	
3	Landscape irrigation		☒	
4	Other:		☐	
5	What is the design capture storm depth? (Figure III.1)	d	0.90	inches
6	What is the project size?	A	242.64	ac
7	What is the acreage of impervious area?	IA	152.99	ac
	For projects with multiple types of demand (toilet flushing, irrigation demand, and/or other demand)			
8	What is the minimum use required for partial capture? (Table X.6)	111,683		gpd
9	What is the project estimated wet season total daily use (Section X.2)?	30,690		gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)	No		
	For projects with only toilet flushing demand			
11	What is the minimum TUTIA for partial capture? (Table X.7)	16,829		users
12	What is the project estimated TUTIA?	21,013		users
13	Is partial capture potentially feasible? (Line 12 > Line 11?)	No		
	For projects with only irrigation demand			
14	What is the minimum irrigation area required based on conservation landscape design? (Table X.8)	154.52		ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)	89.65		ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)	No		

Provide supporting assumptions and citations for controlling demand calculation:
Item 6 – Based on sum of all DMAs
Item 7 – Based on DMA impervious area
Item 8 – 730 gpd x 152.99 ac = **111,683 gpd**
Item 9 – 9.3 x (1,100 x 3 residents min) = **30,690 gpd**
Item 11 – Per Table X.7, minim TUTIA ratio = 110 users/acre x 152.99 acres = **16,829 users**
Item 12 – Per Table X.1 Total use = 9.3 use x (1,100 units x 3 residents min) = 30,690 users. Adjusting value to account for assumption that at least 75% of residents are either at school or work for 10 hours of the day and 25% remain home: Onsite: 30,690 users X (0.25) = 7,673 users at home daily; remaining 23,017 users X 0.58 days (14 hours) = 13,350 users. Estimated total users = 7,673 users + 13,350 users = **21,023 users**
Item 14 – Min. irrigation area for conservation landscape (K_L= 0.35) = 1.01 x 152.99 ac = **154.52 ac**
Item 15 – Proposed irrigated area = 89.65 ac x 1 = **89.65 ac** (HOA/landscape slopes).

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.90	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	See table below	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=		
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=		
4	Calculate runoff volume, $V_{design}= (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=		cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	N/A	In/hr
2	Enter combined safety factor from Worksheet H, $S_{Preliminary}$ (unitless)	$S_{Preliminary}$=	N/A	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{Preliminary}$	K_{design}=	N/A	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	N/A	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	N/A	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	N/A	sq-ft
Calculations				

DMA	ACRES	IMP	C-Value	D_{BMP} (IN)	DCV_{SIMPLE} (FT^3)
1	11.02	0.5	0.525	0.90	18,901.2
2	2.18	0.8	0.750	0.90	5,341.5
3	1.97	0.8	0.750	0.90	4,827.0
4	10.50	0.8	0.750	0.90	25,727.6
5	25.47	0.65	0.638	0.90	53,046.7
6	38.67	0.8	0.750	0.90	94,751.2
7	0.78	0.85	0.788	0.90	2,006.8
8	0.55	0.85	0.788	0.90	1,415.0
9	0.26	0.85	0.788	0.90	668.9
10	0.43	0.85	0.788	0.90	1,106.3
11	0.79	0.85	0.788	0.90	2,032.5
12	26.66	0.5	0.525	0.90	45,726.6
13	51.62	0.5	0.525	0.90	88,537.3
14	2.90	0.65	0.638	0.90	6,039.9

15	2.36	0.65	0.638	0.90	4,915.2	
16	0.17	0.85	0.788	0.90	437.4	
17	0.81	0.65	0.638	0.90	1,687.0	
18	0.80	0.85	0.788	0.90	2,058.2	
19	0.33	0.85	0.788	0.90	849.0	
20	2.78	0.65	0.638	0.90	5,789.9	
21	1.52	0.15	0.263	0.90	1,303.5	
22	1.12	0.65	0.638	0.90	2,332.6	
23	0.80	0.65	0.638	0.90	1,666.2	
24	1.44	0.65	0.638	0.90	2,999.1	
25	3.21	0.65	0.638	0.90	6,685.5	
26	1.53	0.5	0.525	0.90	2,624.2	
27	2.30	0.65	0.638	0.90	4,790.2	
28	0.18	0.85	0.788	0.90	463.1	
29	2.07	0.65	0.638	0.90	4,311.2	
30	1.88	0.65	0.638	0.90	3,915.5	
31	0.49	0.5	0.525	0.90	840.4	
32	1.40	0.5	0.525	0.90	2,401.2	
33	0.67	0.8	0.750	0.90	1,641.7	
34	3.66	0.5	0.525	0.90	6,277.5	
35	0.63	0.5	0.525	0.90	1,080.6	
36	9.86	0.5	0.525	0.90	16,911.6	
37	1.64	0.65	0.638	0.90	3,415.6	
38	1.43	0.65	0.638	0.90	2,978.3	
39	2.83	0.65	0.638	0.90	5,894.1	
40	1.59	0.65	0.638	0.90	3,311.5	
41	20.12	0.8	0.750	0.90	49,299.0	
42	0.82	0.65	0.638	0.90	1,707.8	
43	0.56	0.65	0.638	0.90	1,166.3	

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	See Table Below	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=		in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	
6	Determine the design intensity that must be provided by BMP $I_{design} = I_1 - I_2$	I_{design}=	See Table Below	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), A (acres)	A=	See Table Below	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=		
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=		
4	Calculate design flow rate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=		cfs
Supporting Calculations				

Describe system:

DMA	ACRES	IMP	C-Value	I_{BMP} (IN/HR)	Q_{BMP} (CFS)
1	11.02	0.5	0.525	0.24	1.39
2	2.18	0.8	0.750	0.24	0.39
3	1.97	0.8	0.750	0.25	0.37
4	10.50	0.8	0.750	0.24	1.89
5	25.47	0.65	0.638	0.24	3.90
6	38.67	0.8	0.750	0.24	6.96
7	0.78	0.85	0.788	0.25	0.15
8	0.55	0.85	0.788	0.25	0.11
9	0.26	0.85	0.788	0.25	0.05
10	0.43	0.85	0.788	0.25	0.08
11	0.79	0.85	0.788	0.25	0.16
12	26.66	0.5	0.525	0.24	3.36
13	51.62	0.5	0.525	0.24	6.50
14	2.90	0.65	0.638	0.25	0.46
15	2.36	0.65	0.638	0.25	0.38

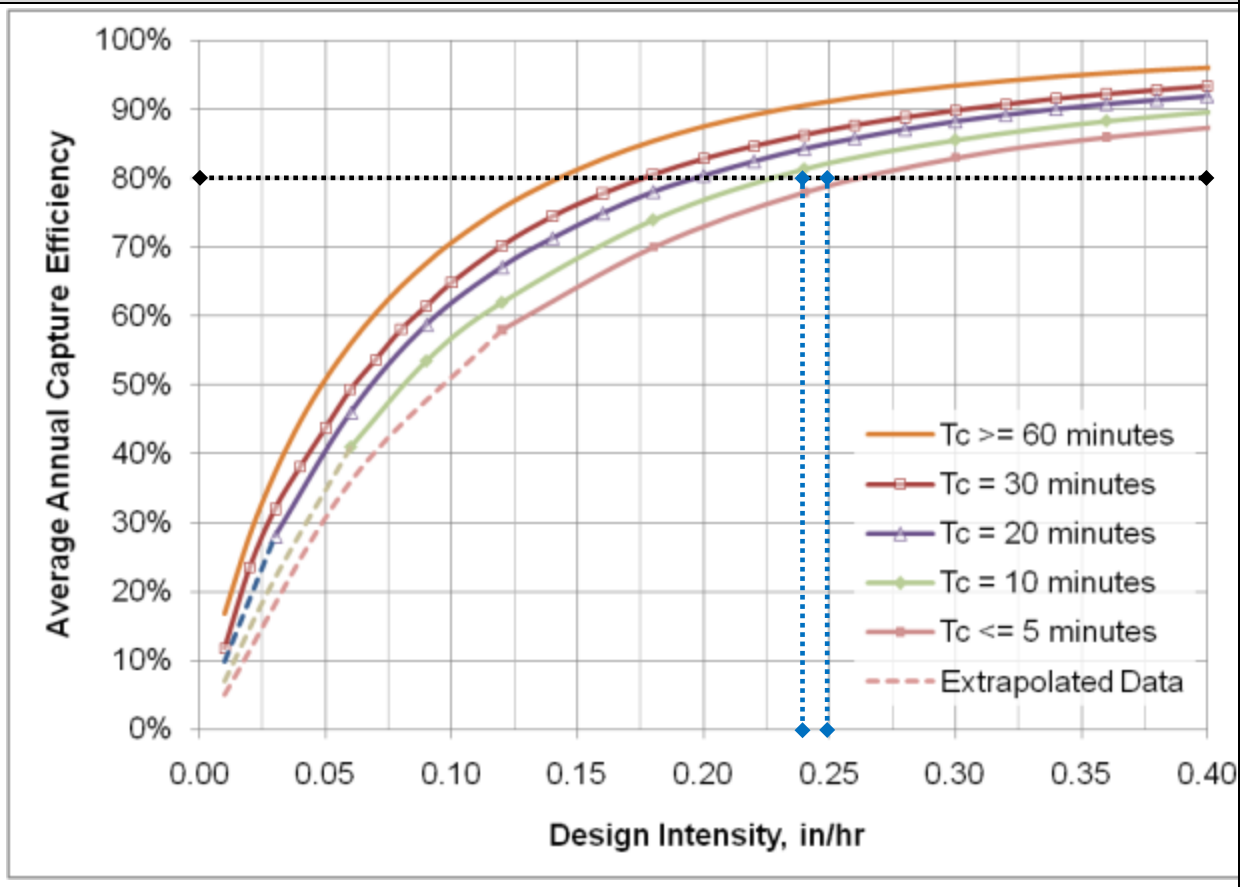
Worksheet D: Capture Efficiency Method for Flow-Based BMPs

16	0.17	0.85	0.788	0.25	0.03
17	0.81	0.65	0.638	0.25	0.13
18	0.80	0.85	0.788	0.25	0.16
19	0.33	0.85	0.788	0.25	0.06
20	2.78	0.65	0.638	0.25	0.44
21	1.52	0.15	0.263	0.25	0.10
22	1.12	0.65	0.638	0.25	0.18
23	0.80	0.65	0.638	0.25	0.13
24	1.44	0.65	0.638	0.25	0.23
25	3.21	0.65	0.638	0.25	0.51
26	1.53	0.5	0.525	0.25	0.20
27	2.30	0.65	0.638	0.25	0.37
28	0.18	0.85	0.788	0.25	0.04
29	2.07	0.65	0.638	0.25	0.33
30	1.88	0.65	0.638	0.25	0.30
31	0.49	0.5	0.525	0.25	0.06
32	1.40	0.5	0.525	0.25	0.18
33	0.67	0.8	0.750	0.25	0.13
34	3.66	0.5	0.525	0.25	0.48
35	0.63	0.5	0.525	0.25	0.08
36	9.86	0.5	0.525	0.24	1.24
37	1.64	0.65	0.638	0.25	0.26
38	1.43	0.65	0.638	0.25	0.23
39	2.83	0.65	0.638	0.25	0.45
40	1.59	0.65	0.638	0.25	0.25
41	20.12	0.8	0.750	0.24	3.62
42	0.82	0.65	0.638	0.25	0.13
43	0.56	0.65	0.638	0.25	0.09
Total	242.80		--	--	36.57

Provide time of concentration assumptions: For small DMAs, assume maximum Tc of 5 mins, followed by 7.5 mins for larger DMAs.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



BMP Details

BIO-1 Bioretention with Underdrains

XIV.5. Biotreatment BMP Fact Sheets (BIO)

Conceptual criteria for biotreatment BMP selection, design, and maintenance are contained in **Appendix XII**. These criteria are generally applicable to the design of biotreatment BMPs in Orange County and BMP-specific guidance is provided in the following fact sheets.

*Note: Biotreatment BMPs shall be designed to provide the maximum feasible infiltration and ET based on criteria contained in **Appendix XI.2**.*

BIO-1: Bioretention with Underdrains

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants. Bioretention with an underdrain are utilized for areas with low permeability native soils or steep slopes where the underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration. **Bioretention must be designed without an underdrain** in areas of high soil permeability.

Also known as:

- *Rain gardens with underdrains*
- *Vegetated media filter*
- *Downspout planter boxes*

Bioretention
Source: Geosyntec Consultants

Feasibility Screening

Considerations

- If there are no hazards associated with infiltration (such as groundwater concerns, contaminant plumes or geotechnical concerns), **bioinfiltration facilities**, which achieve partial infiltration, should be used to maximize infiltration.
- Bioretention with underdrain facilities should be lined if contaminant plumes or geotechnical concerns exist. If high groundwater is the reason for infiltration infeasibility, bioretention facilities with underdrains do not need to be lined.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, road medians, and next to buildings in planter boxes.
- Drainage area is ≤ 5 acres.
- Area is available for infiltration.

- Site must have adequate relief between land surface and the stormwater conveyance system to permit vertical percolation through the soil media and collection and conveyance in underdrain to stormwater conveyance system.

OC-Specific Design Criteria and Considerations

- ☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth is greater than 6 inches to mitigate drowning.
- ☐ The minimum soil depth is 2 feet (3 feet is preferred).
- ☐ The maximum drawdown time of the bioretention ponding area is 48 hours. The maximum drawdown time of the planting media and gravel drainage layer is 96 hours, if applicable.
- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ If infiltration in bioretention location is hazardous due to groundwater or geotechnical concerns, a geomembrane liner must be installed at the base of the bioretention facility. This liner should have a minimum thickness of 30 mils.
- ☐ The planting media placed in the cell shall be designed per the recommendations contained in MISC-1: Planting/Storage Media
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native place species and/or hardy cultivars that are not invasive and do not require chemical inputs should be used to the maximum extent feasible
- ☐ The bioretention area should be covered with 2-4 inches (average 3 inches) or mulch at the start and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ Underdrain should be sized with a 6 inch minimum diameter and have a 0.5% minimum slope. Underdrain should be slotted polyvinyl chloride (PVC) pipe; underdrain pipe should be more than 5 feet from tree locations (if space allows).
- ☐ A gravel blanket or bedding is required for the underdrain pipe(s). At least 0.5 feet of washed aggregate must be placed below, to the top, and to the sides of the underdrain pipe(s).
- ☐ An overflow device is required at the top of the bioretention area ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.
- ☐ Ponding area side slopes shall be no steeper than 3:1 (H:V) unless designed as a planter box BMP with appropriate consideration for trip and fall hazards.

Simple Sizing Method for Bioretention with Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention with underdrain facility, the user selects the basin depth and then determines the appropriate surface area to capture the DCV. The sizing steps are as follows:

Step 1: Determine DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$DD_P = (d_P / K_{MEDIA}) \times 12$ in/

ft Where:

DD_P = time to drain ponded water, hours

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media infiltration rate until 48 hour drawdown time is achieved.

Step 3: Determine the Depth of Water Filtered During Design Capture Storm

The depth of water filtered during the design capture storm can be estimated as the amount routed through the media during the storm, or the ponding depth, whichever is smaller.

$d_{FILTERED}$ = Minimum [$((K_{MEDIA} \times T_{ROUTING})/12)$, d_P]

Where:

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

$T_{ROUTING}$ = storm duration that may be assumed for routing calculations; this should be assumed to be no greater than 3 hours. If the designer desires to account for further routing effects, the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) should be used.

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Step 4: Determine the Facility Surface Area

$A = DCV / (d_P + d_{FILTERED})$

Where:

A = required area of bioretention facility, sq-ft

DCV = design capture volume, cu-ft

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Capture Efficiency Method for Bioretention with Underdrains

If the bioretention geometry has already been defined and the user wishes to account more explicitly for routing, the user can determine the required footprint area using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_p / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

K_{DESIGN} = design media infiltration rate, in/hr (assume 2.5 inches per hour unless otherwise proposed)

If drawdown is less than 3 hours, the drawdown time should be rounded to 3 hours or the Capture Efficiency Method for Flow-based BMPs (See **Appendix III.3.3**) shall be used.

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

A = Design Volume / d_p

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

Design Volume = fraction of DCV, adjusted for drawdown, cu-ft (see Step 2)

d_p = ponding depth of water stored in bioretention area, ft (from Step 1)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the bioretention cell. For example, bioretention could be used to manage overflow from a cistern.
- Bioretention areas can be used to provide pretreatment for underground infiltration systems.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: **http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf**
- SMC LID Manual (pp 68): **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- San Diego County LID Handbook Appendix 4 (Factsheet 7): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**

  Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**

BIO-7 Proprietary Biotreatment

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- *Catch basin planter box*
- *Bioretention vault*
- *Tree box filter*

Proprietary biotreatment
Source: http://www.americastusa.com /index.php/filterra/

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

☐ In right of way areas, plant selection should not impair traffic lines of site. Local jurisdictions may also limit plant selection in keeping with landscaping themes.

Computing Sizing Criteria for Proprietary Biotreatment Device

- Proprietary biotreatment devices can be volume based or flow-based BMPs.
- Volume-based proprietary devices should be sized using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** or the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs described in **Appendix III.3.2**.
- The required design flowrate for flow-based proprietary devices should be computed using the Capture Efficiency Method for Flow-based BMPs described in **Appendix III.3.3)**.

Additional References for Design Guidance

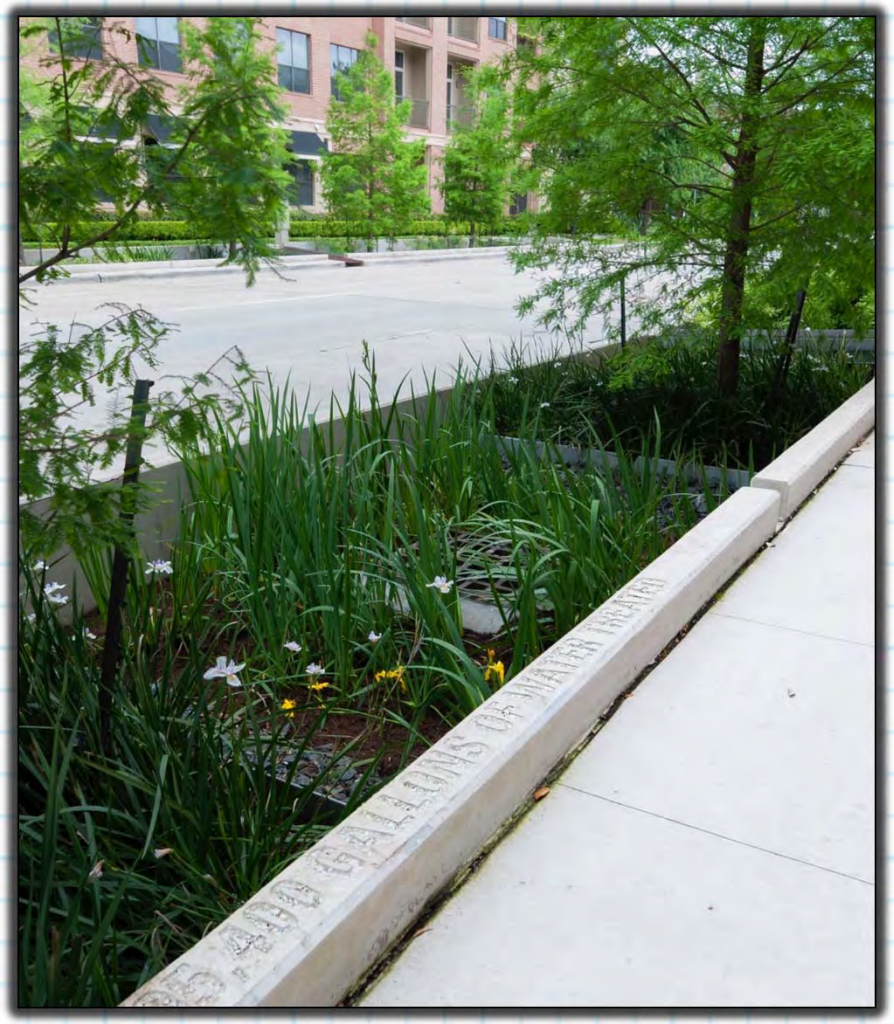
- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- Santa Barbara BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

Proprietary Biotreatment Alternatives (Focal Point, Filterra, Modular Wetland System)

FocalPoint
BIOFILTRATION SYSTEMS

Next Generation Bioretention

High Performance Modular System



- **Reduced Infrastructure Cost**
- **Reduced Overall Maintenance Cost**

ACF ENVIRONMENTAL
LET'S GET IT DONE

FocalPoint Scalable Biofiltration System Application Concepts:

- ***Traditional SWM***
- ***Green Infrastructure***
- ***Low Impact Development***

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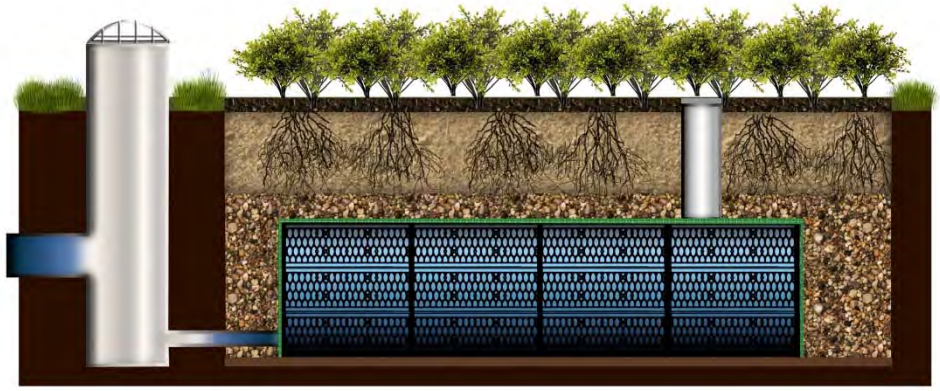
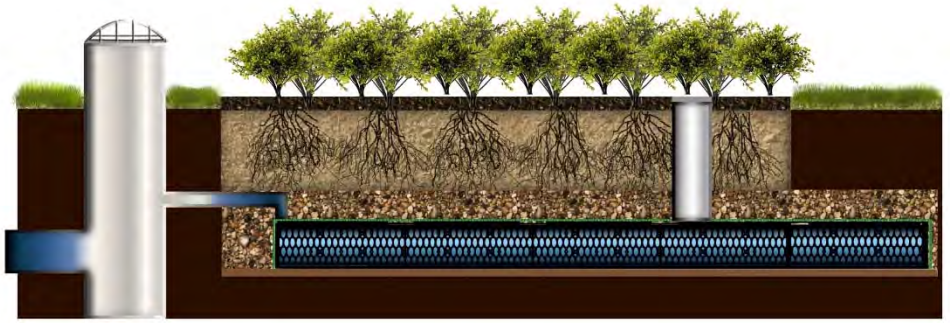
BIOFILTRATION SYSTEMS

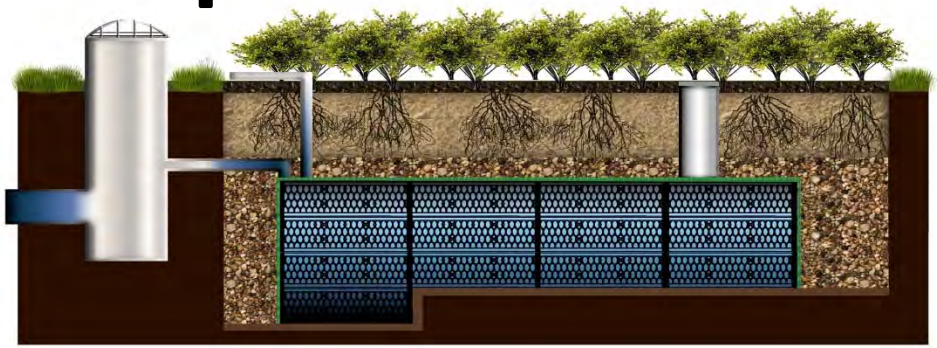
FocalPoint HPMBS gives designers maximum flexibility in meeting both water quality and water volume requirements!



Expanded Detention



Expanded Infiltration

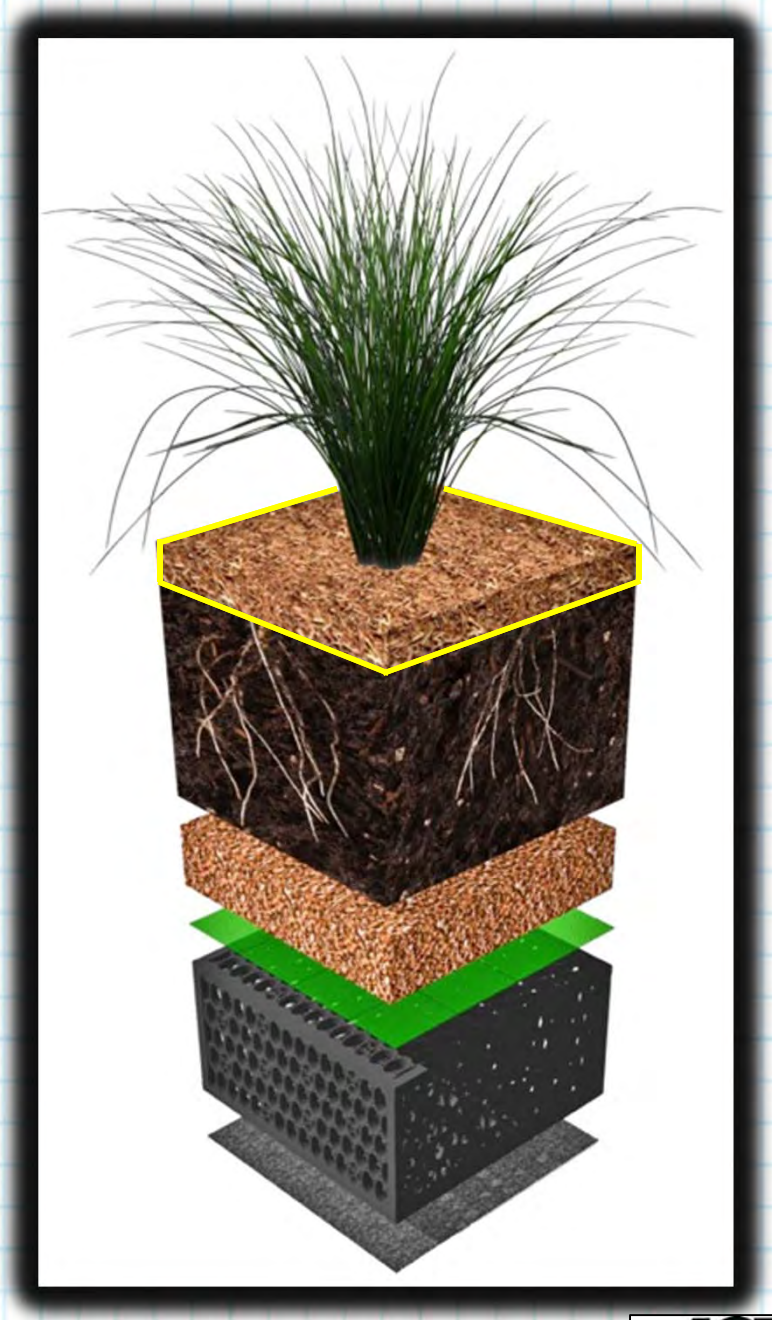


Rain Water Harvesting

FocalPoint
BIOFILTRATION SYSTEMS

3” Layer of Shredded Hardwood Mulch:

- Acts as pre-treatment mechanism to capture silt, sediment and certain pollutants.
- Removal and replacement of mulch represents the bulk of system maintenance!



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18” High Performance Media:

- Flows at 100” Per Hour!
- Flows Faster With Age as Root System Grows
- Resistant to Clogging

Pollutant Removal:

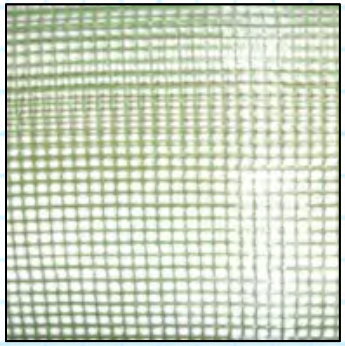
- TSS = 91%
- Nitrogen = 48%
- Phosphorus = 66%

FocalPoint
BIOFILTRATION SYSTEMS

Quality Assurance/ Quality Control (QA/QC):

- All Components of the FocalPoint System are sold as a bundle to provide raw material quality control.
- Media Certification
- Performance Guarantee backed with In-Situ Testing at Time of Install and One Year Later!

6” Bridging Stone & Separation Layer:



Clean Stone & Micro-Mesh Replace Traditional Geotextile Layer

No Geotextile = No Clogging

ACF ENVIRONMENTAL
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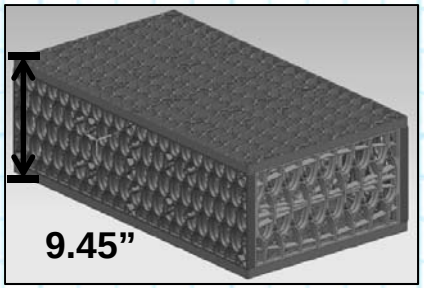
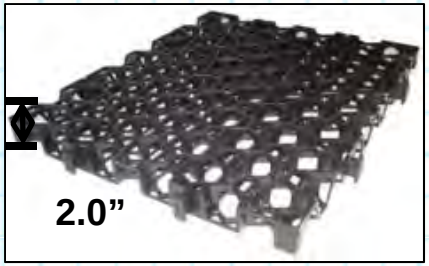
High Performance Underdrain:

9.45” Modular Tank, or “Flat Pipe” w/95% Open Surface Collects Water Efficiently.



System Depth 36

2” Low-Profile Panel Addresses Shallow Applications.



System Depth 29

Expand into Modular Tanks for Larger Storage Needs.

FocalPoint Maintenance Manual:

Provides Comprehensive Guidance & Record Keeping Tools.

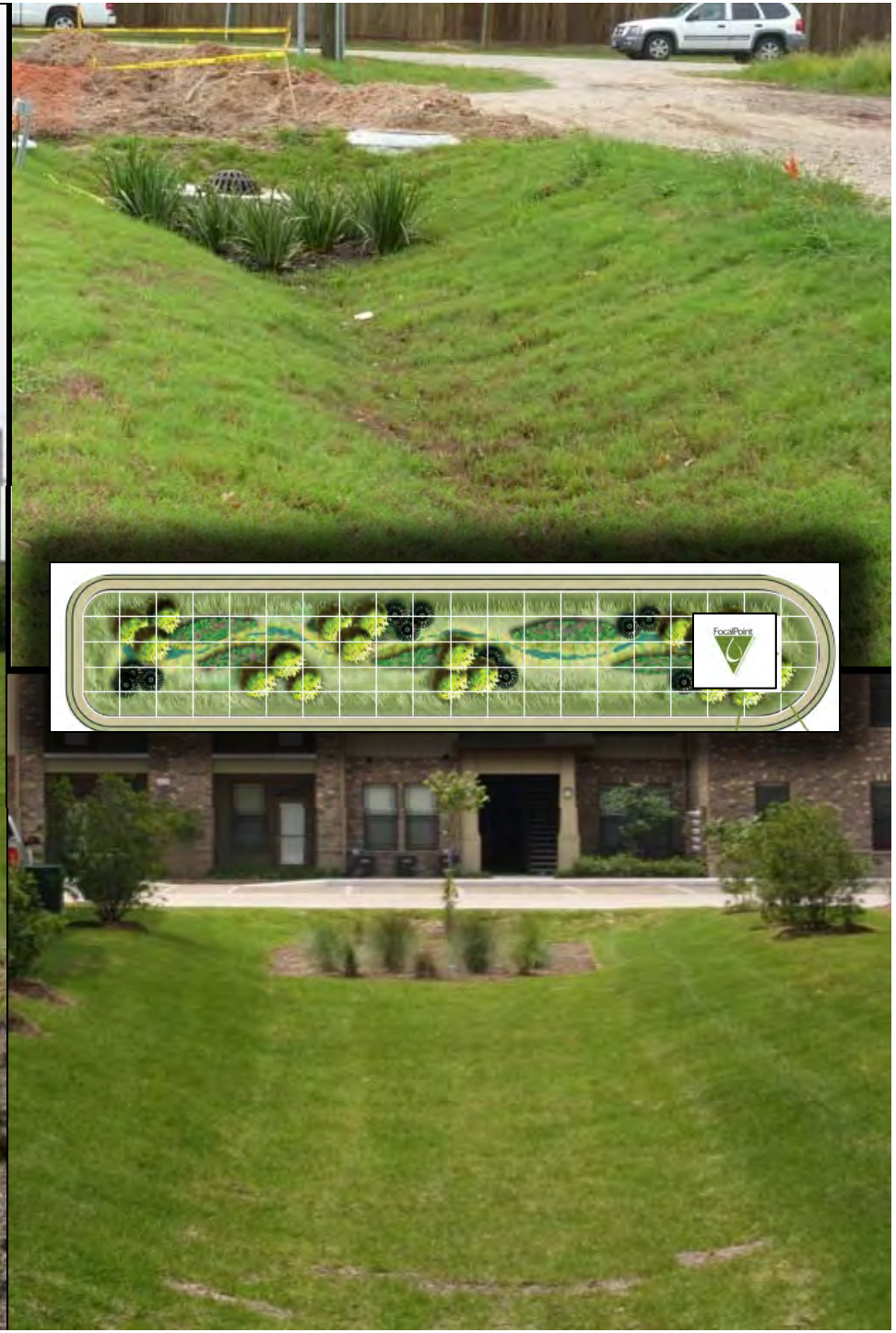
1st Year of Maintenance Included!

Pick Up Trash

Remove & Replace Mulch

Clean Sediment Entry Points

Design With A Low Cost and Easy to Maintain Surface Depression to Implement Low Impact Development:

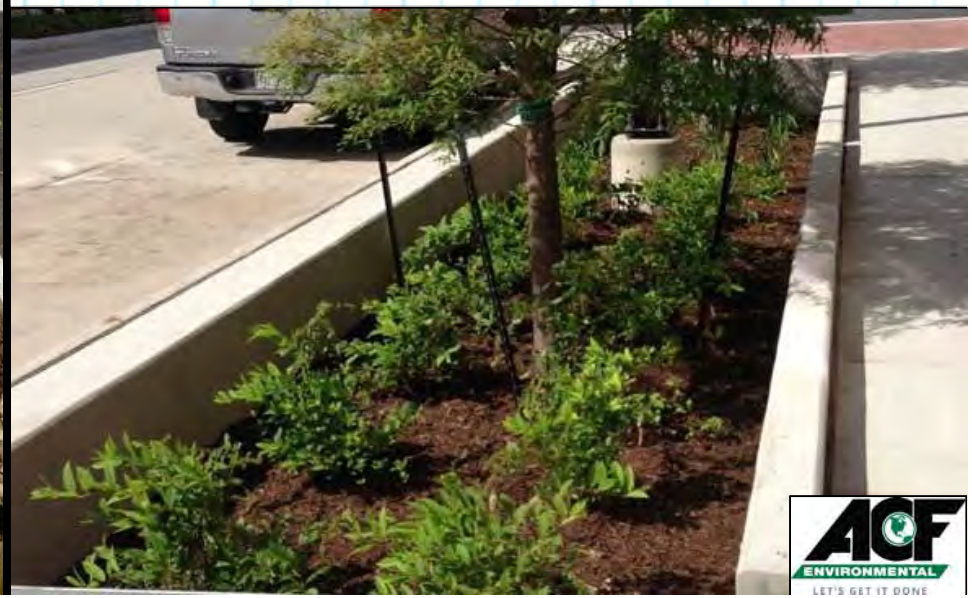


Example Applications:

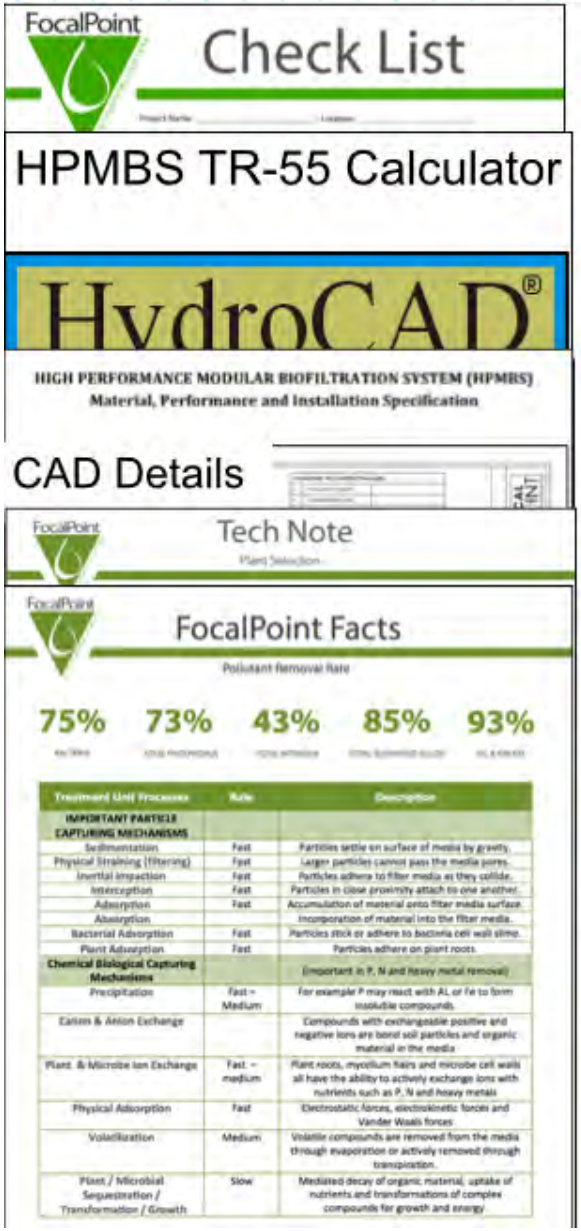
Parking Lots

Highway

Urban retrofit



ACF's Engineering team can provide project specific support or you can access the tools below:



- Specifications
- Calculator
- CAD Details
- Flow Rate & Pollutant Removal Documentation
- Media Certification
- Installation & Maintenance Manuals
- Performance Guarantee
- And More!

FOCALPOINT HP PERFORMANCE SPECIFICATION:

HIGH PERFORMANCE MEDIA

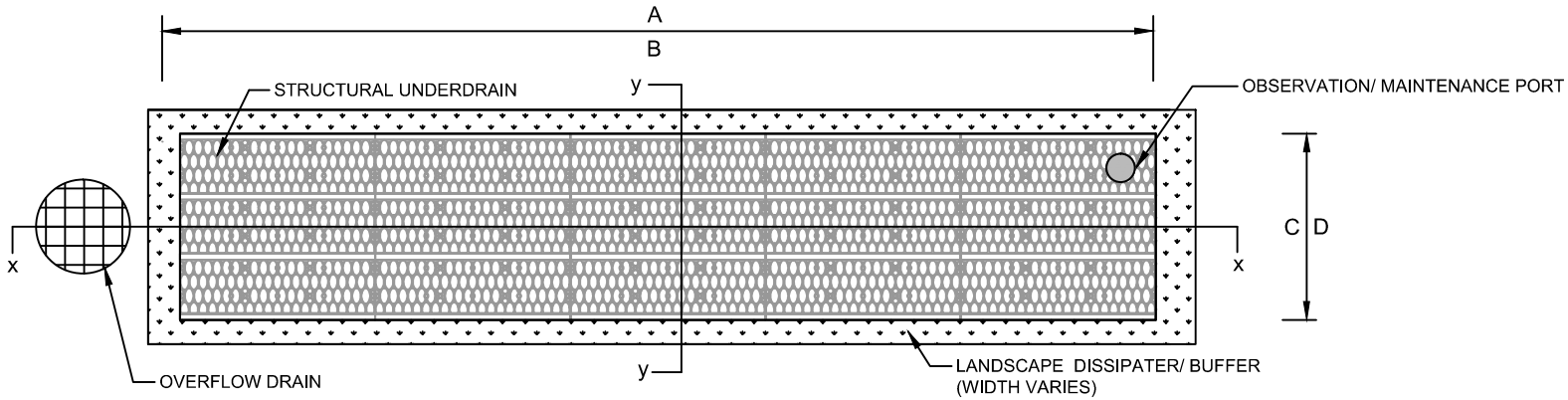
HIGH PERFORMANCE MEDIA MUST MEET A MINIMUM OF 100" PER HOUR INFILTRATION RATE.
FIELD HYDRAULIC CONDUCTIVITY TESTING MUST BE CONDUCTED WITHIN 30 DAYS OF INSTALLATION.
FIELD TEST MUST BE CONDUCTED WITH PROSCRIBED INFILTROMETER AND SOP (SEE SPECIFICATION).
FAILURE TO MEET FIELD TESTING WILL RESULT IN THE REMOVAL OF MEDIA AND REPLACEMENT FROM ALTERNATE BATCH.

HIGH PERFORMANCE STRUCTURAL UNDERDRAIN

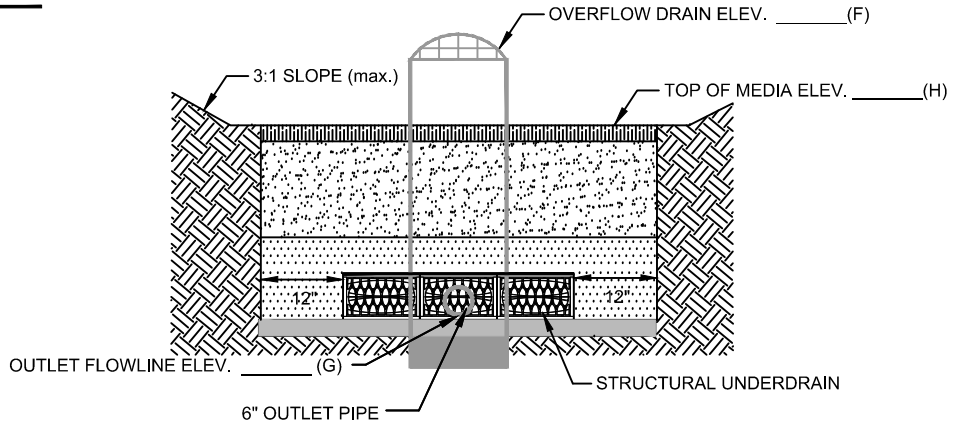
MUST HAVE A MINIMUM OF 19 SQUARE INCHES OF ORIFICE OPENING PER SQUARE FOOT.
MUST MEET H20 LOADING REQUIREMENTS.
MUST BE MODULAR IN NATURE AND ASSEMBLED ON SITE.
MUST HAVE MINIMUM 90% INTERIOR VOID SPACE.

FOCALPOINT HP CONSTRUCTION GUIDE		
A	FOCALPOINT LENGTH	
B	# UNDERDRAIN LONG	
C	FOCALPOINT WIDTH	
D	# UNDERDRAIN WIDE	
E	WATER QUALITY VOLUME	
F	OVERFLOW ELEVATION	
G	OUTLET FLOWLINE	
H	TOP OF MEDIA	
I	TOP OF GABION (OPTIONAL)	

PLAN VIEW



SECTION Y-Y



FOCALPOINT HP CONSTRUCTION GUIDE

FocalPoint BIOFILTRATION SYSTEMS

TO FIND A VALUE ADDED RESELLER IN YOUR AREA VISIT
WWW.CONVERGENTWATER.COM/STORMWATER-PRODUCTS OR CONTACT
CONVERGENT WATER TECHNOLOGIES AT 800.771.5428

CONVERGENT WATER TECHNOLOGIES

FOCALPOINT HP DETAILED CROSS SECTION

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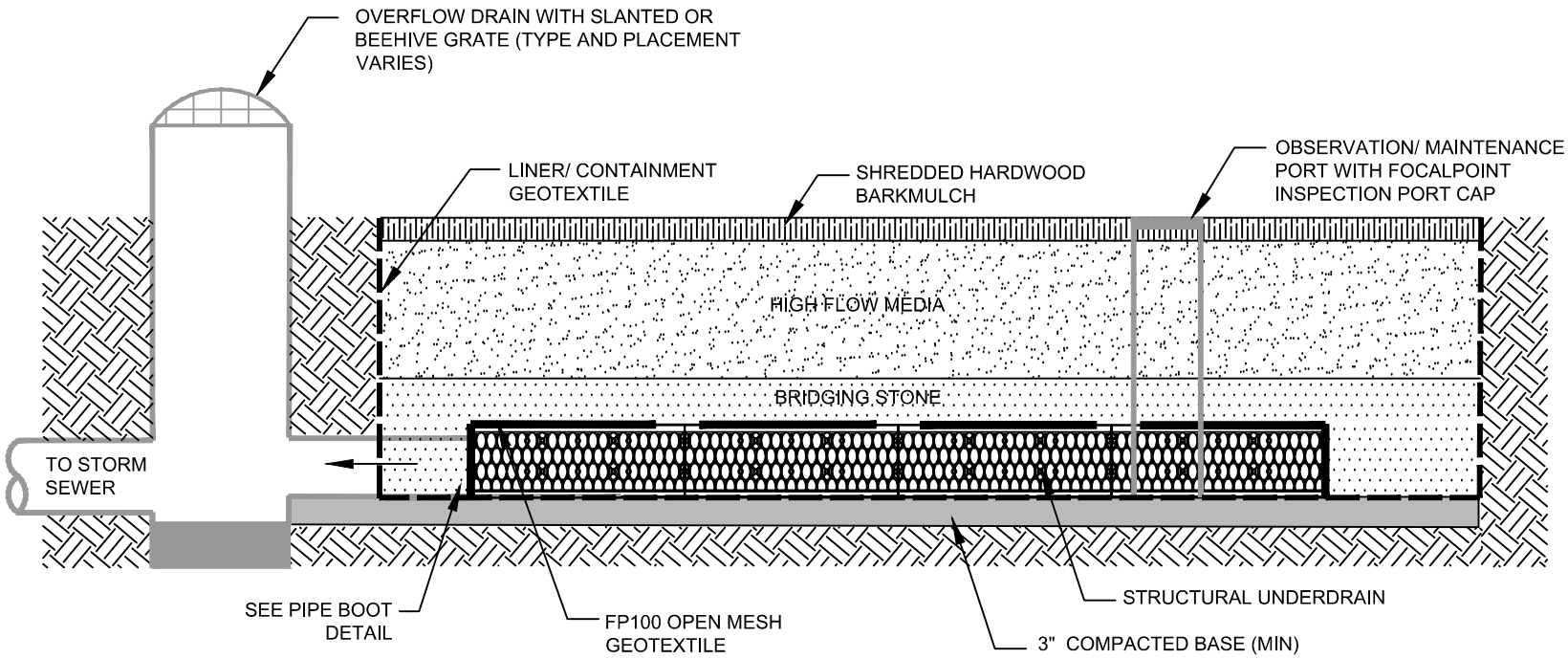
CONVERGENT
WATER TECHNOLOGIES

FOCALPOINT HP SECTION X-X



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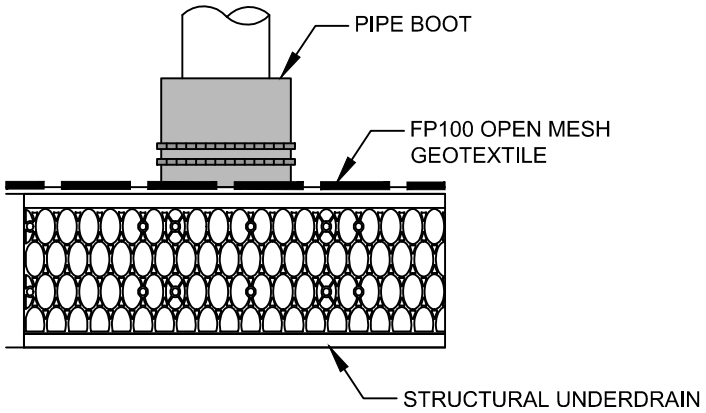
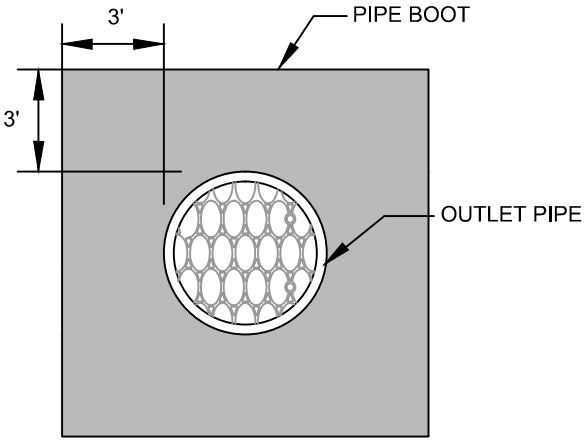
CONVERGENT WATER TECHNOLOGIES

OBSERVATION/ MAINTENANCE PORT CONNECTION

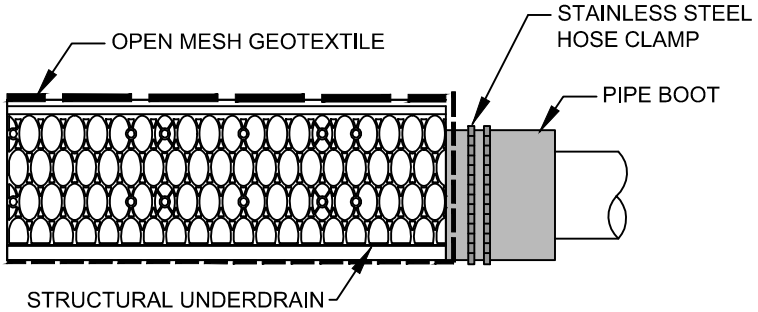


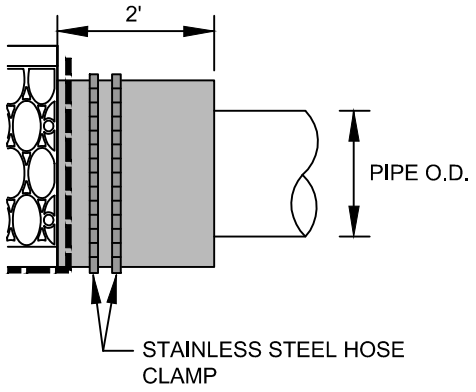
PIPE BOOT DETAIL



FRONT VIEW

OUTLET/ INLET PIPE CONNECTION





SIDE VIEW

FOCALPOINT PIPE CONNECTION

FocalPoint BIOFILTRATION SYSTEMS

TO FIND A VALUE ADDED RESELLER IN YOUR AREA VISIT
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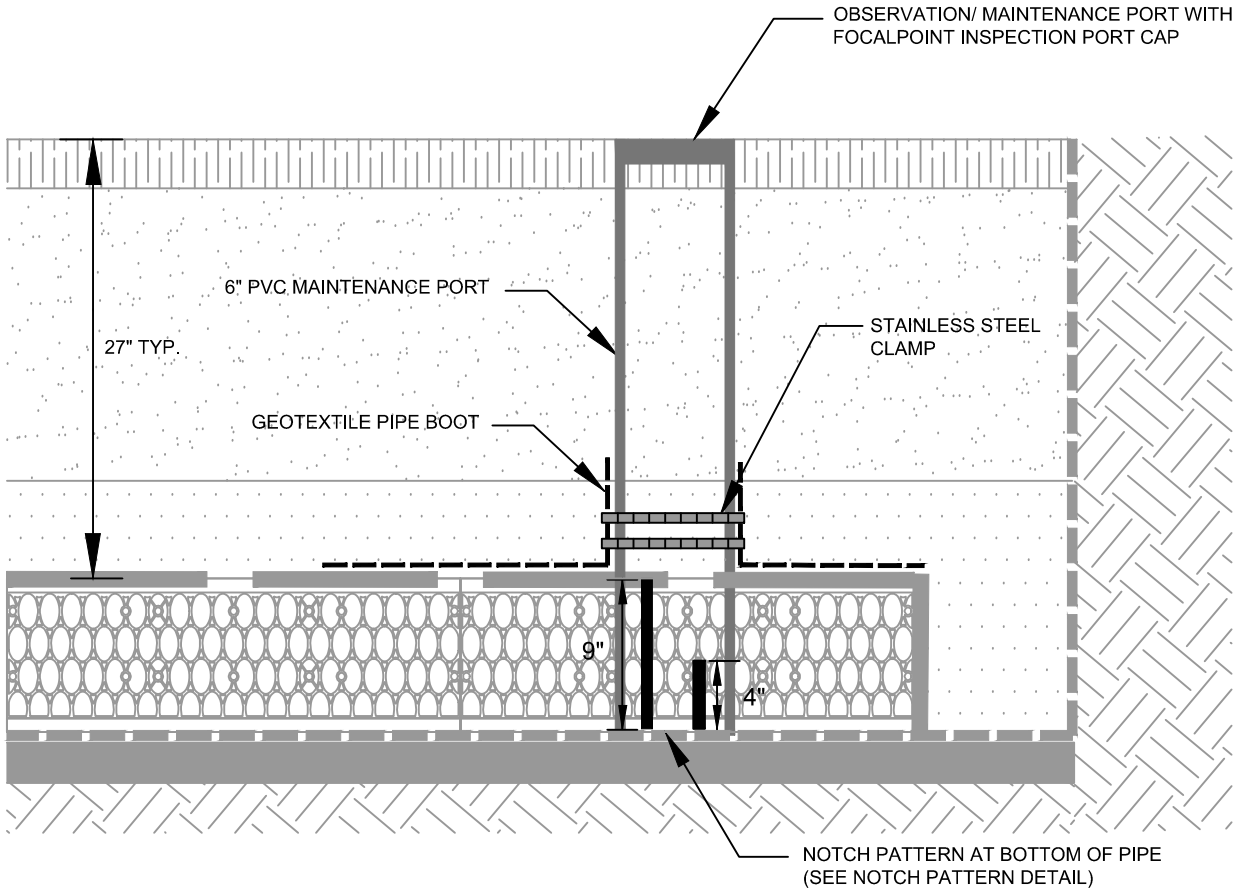
CONVERGENT WATER TECHNOLOGIES AT 800.771.5428

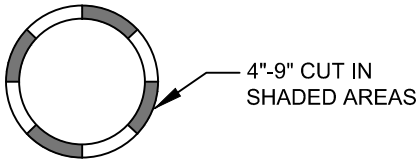
CONVERGENT WATER TECHNOLOGIES

OBSERVATION/ MAINTENANCE PORT

PORT USED FOR INSPECTION PURPOSES AND FOR SYSTEM MAINTENANCE AS REQUIRED. WATER SHALL BE PUMPED INTO THE SYSTEM AND RESUSPEND ACCUMULATED SEDIMENT. MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION FOR THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER FLUSH AS NEEDED.



PIPE NOTCH PATTERN DETAIL



FOCALPOINT OBSERVATION/ MAINTENANCE PORT

FocalPoint BIOFILTRATION SYSTEMS

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CONVERGENT WATER TECHNOLOGIES

CONTECH®
ENGINEERED SOLUTIONS

Filterra®
High Performance Bioretention

The experts you need to solve your stormwater challenges

Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team

STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.

STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.

REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.

SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Low Impact Development in a Small Footprint – Filterra®

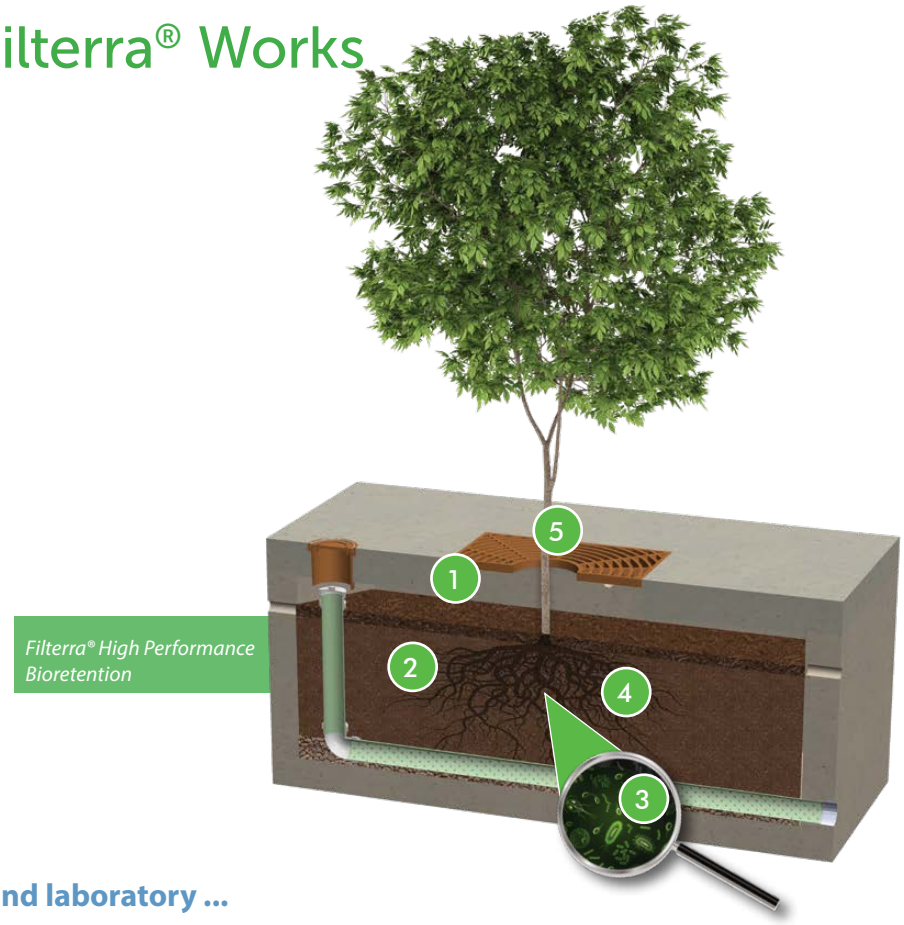
Filterra is an engineered high-performance bioretention system. While it operates similar to traditional bioretention, its high flow media allows for a reduction in footprint of up to 95% versus traditional bioretention practices. Filterra provides a Low Impact Development (LID) solution for tight, highly developed sites such as urban development projects, commercial parking lots, residential streets, and streetscapes. Its small footprint also reduces installation and life cycle costs versus traditional bioretention. Filterra can be configured in many different ways to enhance site aesthetics, integrate with other LID practices, or increase runoff reduction through infiltration below or downstream of the system.

At the Manchester Stormwater Park seen above, the Filterra systems surrounding the central courtyard allowed for the creation of a community space with parking, sidewalks, and benches in a quaint downtown area. A traditional bioretention system treating the same drainage area would have occupied the entire park area leaving no room for these amenities.

filterra® Bioretention Systems

filterra® Bioscape®

How the Filterra® Works



Tested in the field and laboratory ...

1. Stormwater enters the Filterra through a pipe, curb inlet, or sheet flow and ponds over the pretreatment mulch layer, capturing heavy sediment and debris. Organics and microorganisms within the mulch trap and degrade metals and hydrocarbons. The mulch also provides water retention for the system's vegetation.

2. Stormwater flows through engineered Filterra media which filters fine pollutants and nutrients. Organic material in the media removes dissolved metals and acts as a food source for root-zone microorganisms. Treated water exits through an underdrain pipe or infiltrates (if designed accordingly).

3. Rootzone microorganisms digest and transform pollutants into forms easily absorbed by plants.

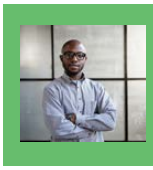
4. Plant roots absorb stormwater and pollutants that were transformed by microorganisms, regenerating the media's pollutant removal capacity. The roots grow, provide a hospitable environment for the rootzone microorganisms and penetrate the media, maintaining hydraulic conductivity.

5. The plant trunk and foliage utilize nutrients such as Nitrogen and Phosphorus for plant health, sequester heavy metals into the biomass, and provide evapotranspiration of residual water within the system.

Plants and organic material are vital to the long term performance of bioretention systems

Filterra® Features and Benefits

FEATURE	BENEFITS
High biofiltration media flow rate (up to 175"/hr+)	Greatly reduced footprint versus traditional bioretention and LID solutions
Filterra system is packaged, including all components necessary for system performance	Quality control for easy, fast and successful installation
Quick and easy maintenance	Low lifecycle costs
Variety of configurations and aesthetic options	Integrates easily into any site or landscape plan
Natural stormwater management processes featuring organics and vegetation	Meets Low Impact Development requirements and ensures long-term performance



The Filterra system can be configured with many different aesthetic options

Select Filterra® Approvals

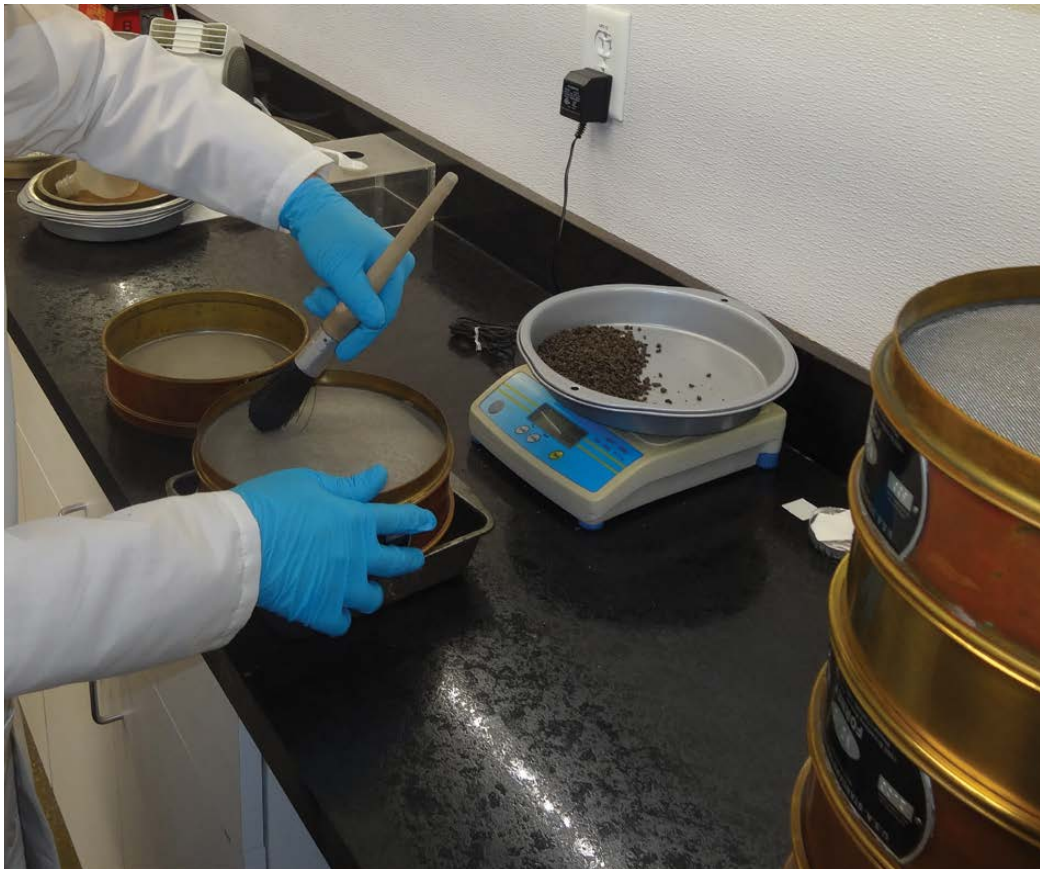
Filterra is approved through numerous local, state and federal verification programs, including:

- New Jersey Department of Environmental Protection (NJ DEP)
- Washington Department of Ecology (GULD) – Basic, Enhanced, Phosphorus, and Oil
- Maryland Department of the Environment - Environmental Site Design (ESD)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)
- Maine Department of Environmental Protection (ME DEP)
- Atlanta, GA Regional Commission
- Los Angeles County, CA - Alternate to Attachment H
- City of Portland, Oregon Bureau of Environmental Services
- North Carolina Department of Environmental Quality (NC DEQ)

Filterra® Performance Testing Results

APPLICATION TIPS

- The Filterra system has been tested under industry standard protocols and has proven its pollutant removal performance and system longevity.
- Contech invests significant resources in media blending calibration and product testing to ensure our media meets our strict performance specifications every time.
- Keep regulators and owners happy by selecting a product with predictable and proven maintenance longevity.



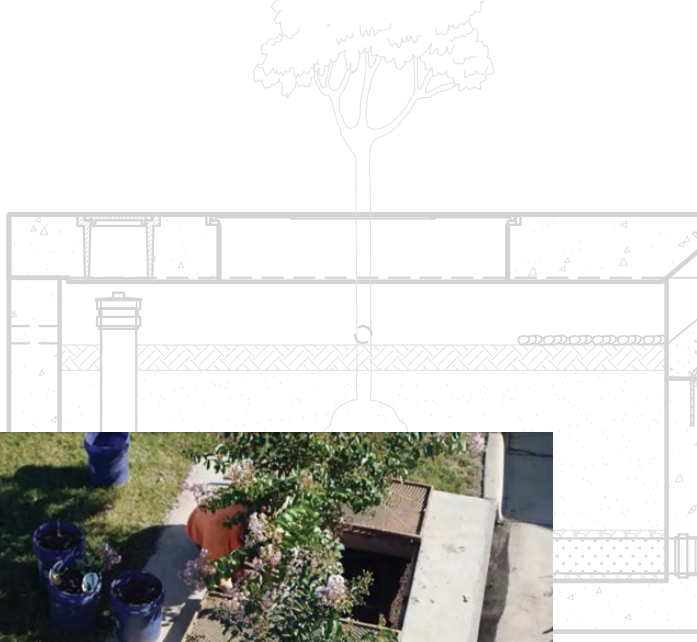
POLLUTANT OF CONCERN	MEDIAN REMOVAL EFFICIENCY	MEDIAN EFFLUENT CONCENTRATION (MG/L)
Total Suspended Solids (TSS)	86%	3.3
Total Phosphorus - TAPE (TP)	70%	0.05
Total Nitrogen (TN)	34%	0.54
Total Copper (TCu)	55%	0.004
Total Dissolved Copper	43%	0.003
Total Zinc (TZn)	56%	0.04
Total Dissolved Zinc	54%	0.1
Total Zinc (TZn)	56%	0.04
Total Petroleum Hydrocarbons	87%	0.71

Each batch of Filterra® media has been extensively tested to ensure consistent performance every time.

Sources:
UVA (TARP) Field Study - 2006
Herrera (TAPE) Study - 2009
Herrera (TAPE) Study - 2014
NC State Study - 2015

Note: Some jurisdictions recognize higher removal rates. Contact your Contech Stormwater Consultant for performance expectations.

Filterra® Maintenance



Activation and first year of maintenance is included with every system.*

With proper routine maintenance, the engineered media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation.* This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation.

Maintenance is low-cost, low-tech and simple:

- Remove trash, sediment, and mulch
- Replace with a fresh 3" layer of mulch
- No confined space entry or special tools
- Easily performed by landscape contractor or facilities maintenance provider

** Some exclusions may apply.*

Filterra offers high performance bioretention for advanced pollutant removal with easy maintenance.

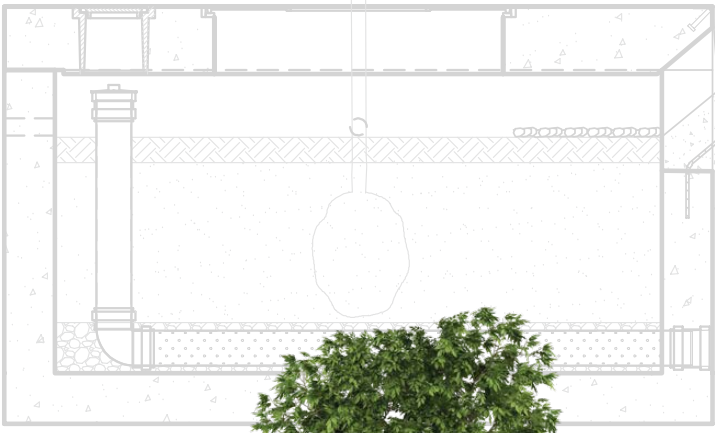
Plant health evaluation and pruning is important to encourage growth.

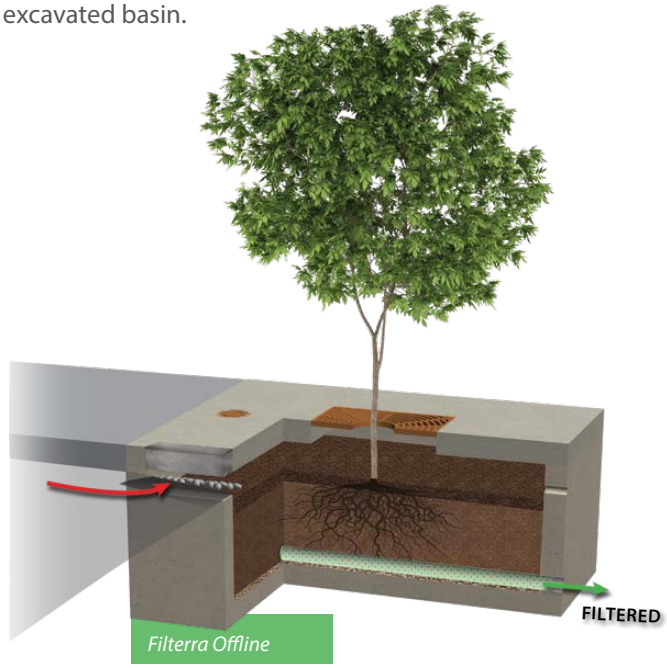
All stormwater treatment systems require maintenance for effective operation.

Filterra® Configurations

Multiple system configurations integrate with site hydraulic design and layout ...

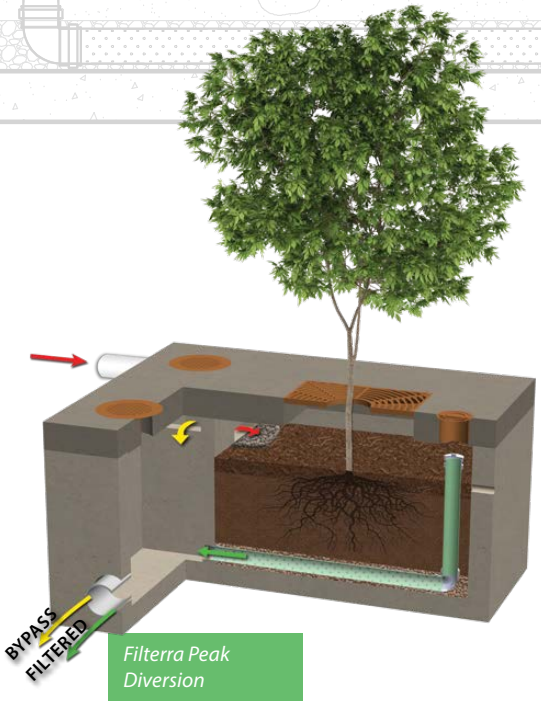
The Filterra is available in a variety of precast configurations as well as Filterra Bioscape, which can be installed directly into an excavated basin.



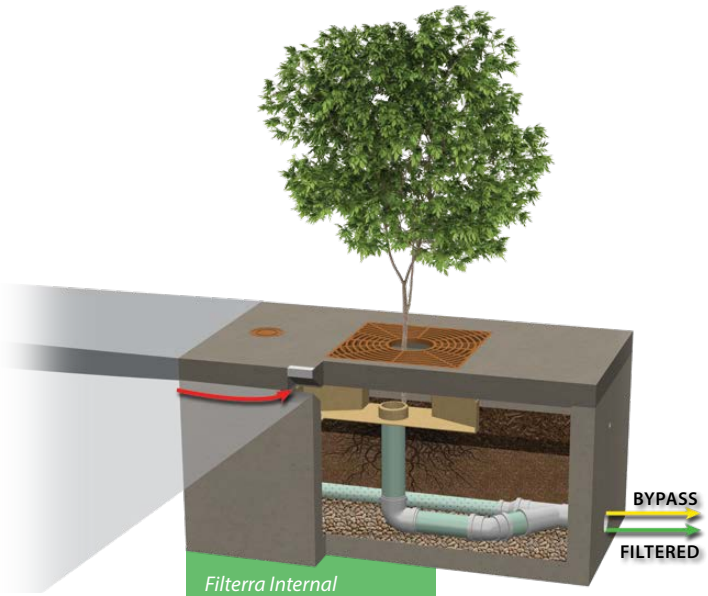


Filterra Offline

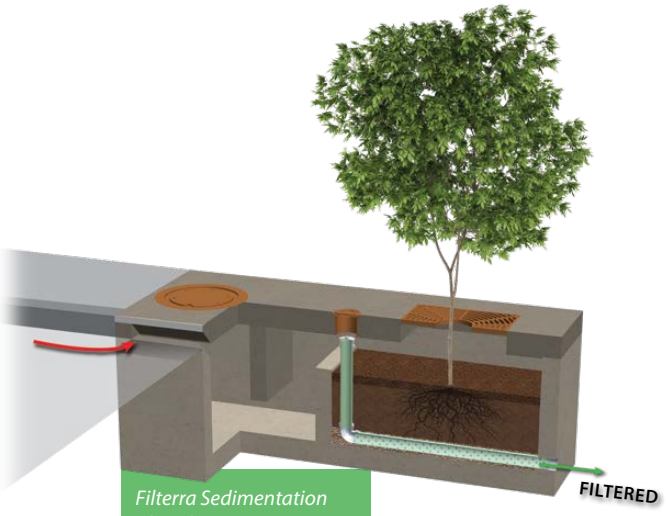
Bypass via downstream catch basin.



Filterra Peak Diversion



Filterra Internal Bypass Curb



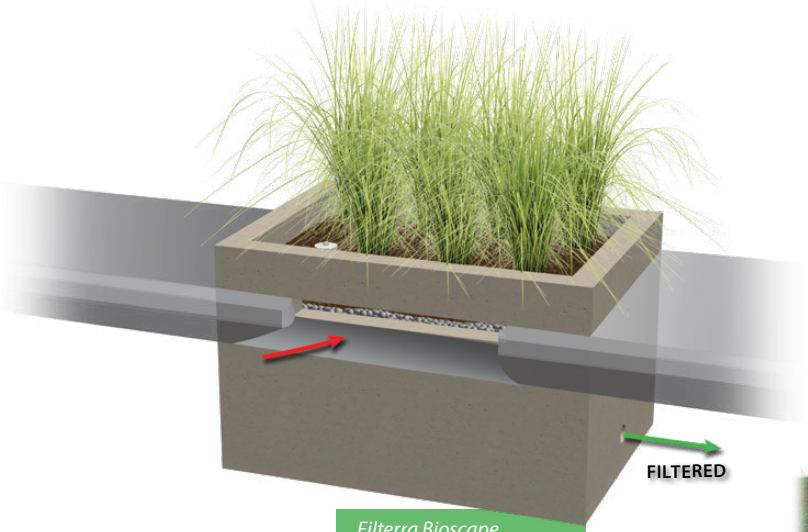
Filterra Sedimentation Chamber

Bypass via downstream catch basin.

**Additional configurations available, including offline - pipe, peak diversion - grate, and internal bypass curb-chamber.*

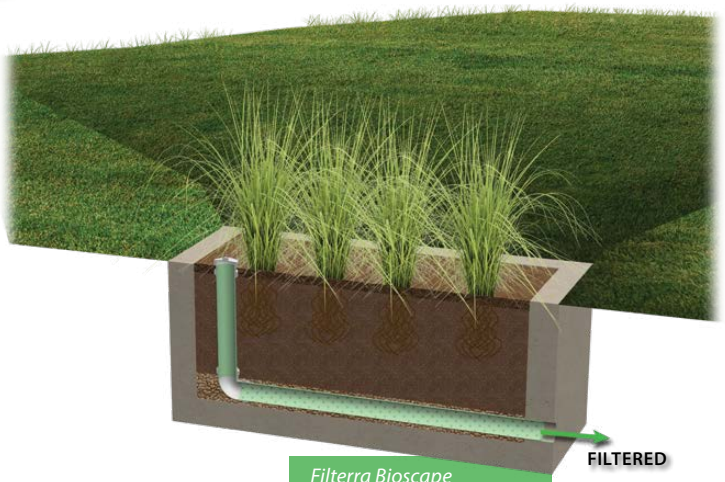
Multiple configurations allow for easy site integration

Filterra® Bioscape® Configurations



Filterra Bioscape Vault Offline

Bypass via downstream catch basin.



Filterra Bioscape Vault Basin

Bypass via upstream structure. Multiple inlet options.

Filterra Bioscape

Bypass via upstream structure. Multiple inlet options.

**Additional configurations available, including bioscape vault offline pipe.*

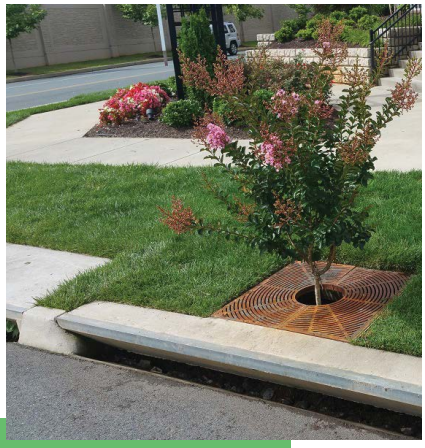
Filterra® Aesthetic Options

Multiple aesthetic options to enhance the appearance and integrate with landscaping ...

Standard Tree Grate

Custom/Decorative Tree Grate

Full Grate with Grasses



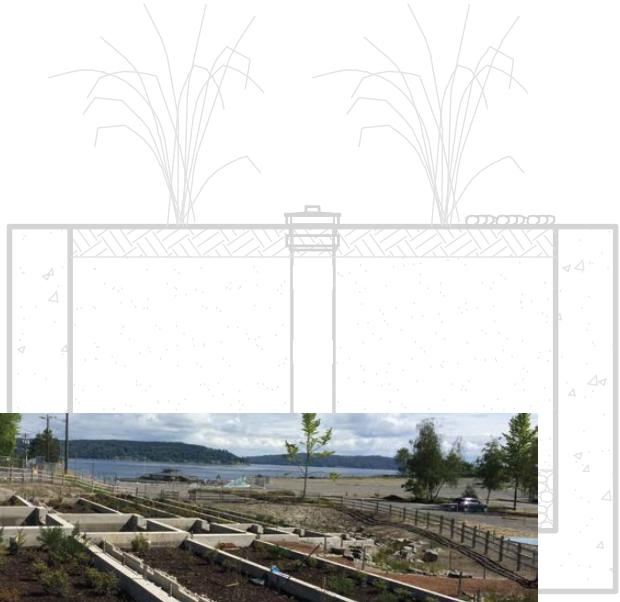
Recessed Top Slab

Open Top Planter - Filterra Bioscape

Street Tree

An aesthetic solution to meet your bioretention needs

Filterra® Bioscape®



Large-scale Filterra that can be customized to your site ...

- Ideal for Filterra systems greater than 300 square feet
- Design with or without containment structure
- Incorporate infiltration directly below the system, where required
- Combine with upstream storage or downstream infiltration
- Use as an alternative to larger regional traditional bioretention systems
- Easily add pretreatment Hydrodynamic Separator for large-scale or heavy pollutant loading applications

A partner you can rely on

STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

For more information: www.ContechES.com

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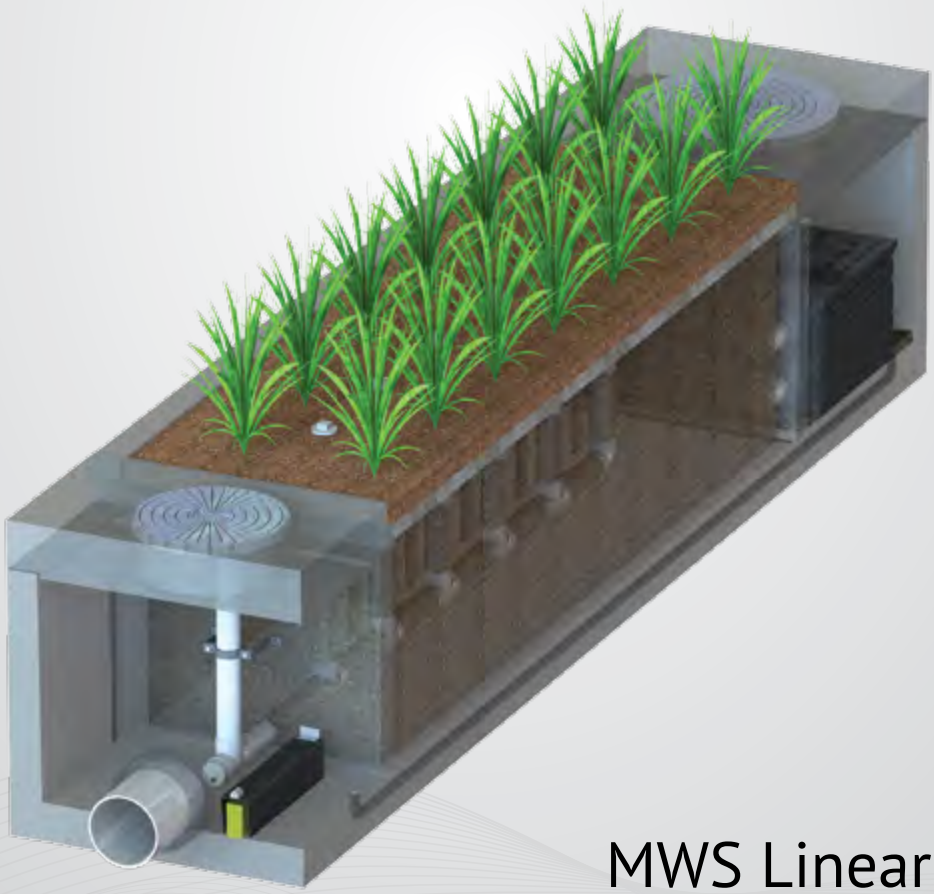
MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*



MWS Linear

Contents

1 Introduction

2 Applications

3 Configurations

4 Advantages

5 Operation

6 Orientations | Bypass

7 Performance | Approvals

8 Sizing

9 Installation | Maintenance | Plants

The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.

MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.

Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.

Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications are available on our website: www.ModularWetlands.com/Applications

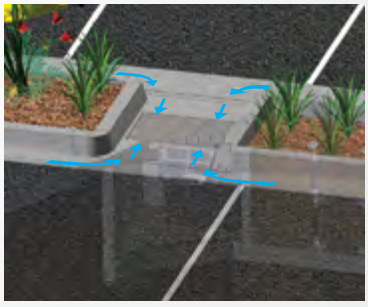
- Agriculture
- Reuse
- Low Impact Development
- Waste Water

Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.

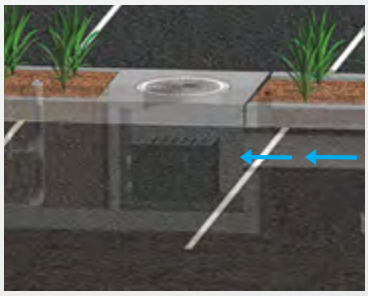
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

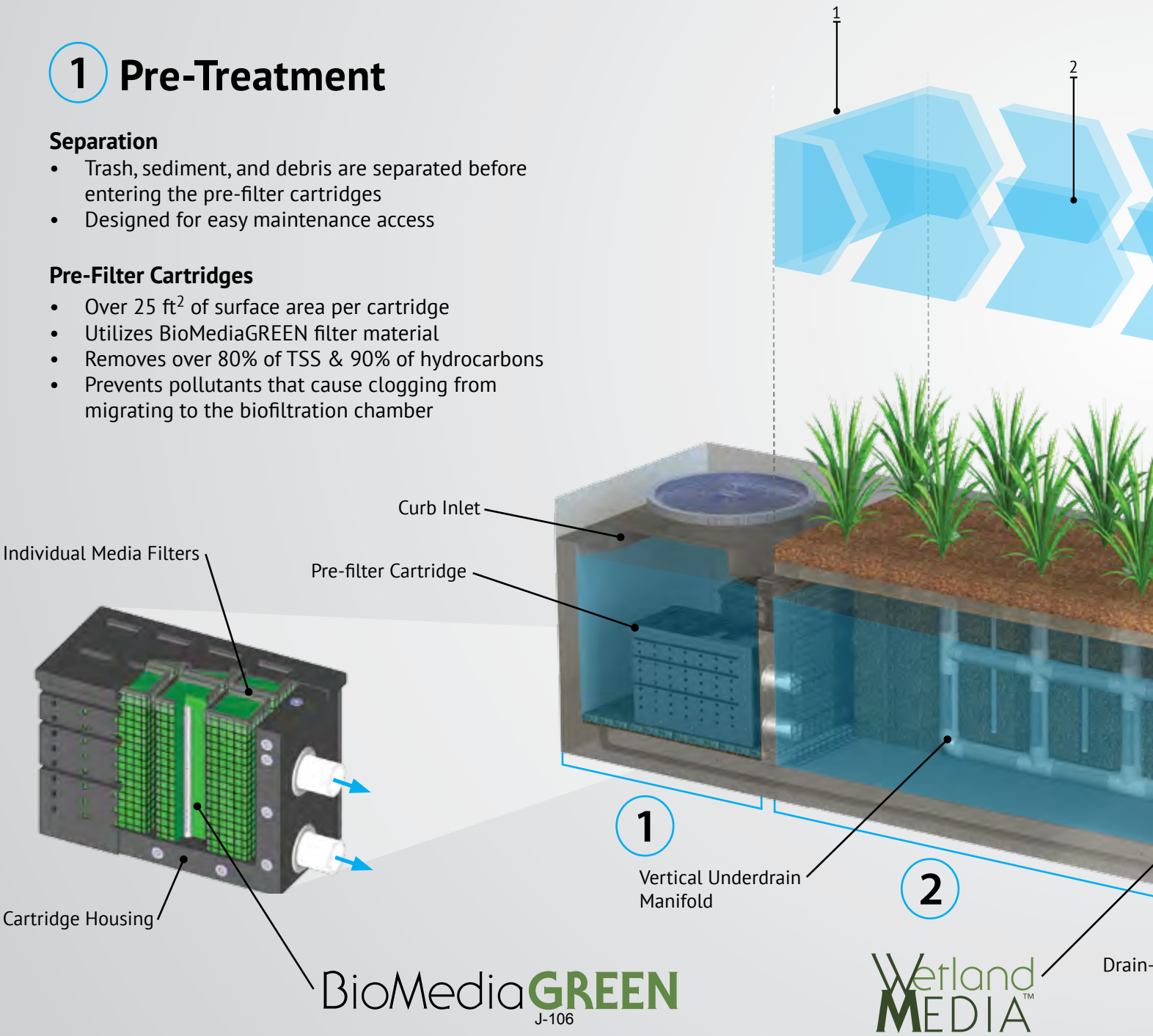
1 Pre-Treatment

Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft^2 of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



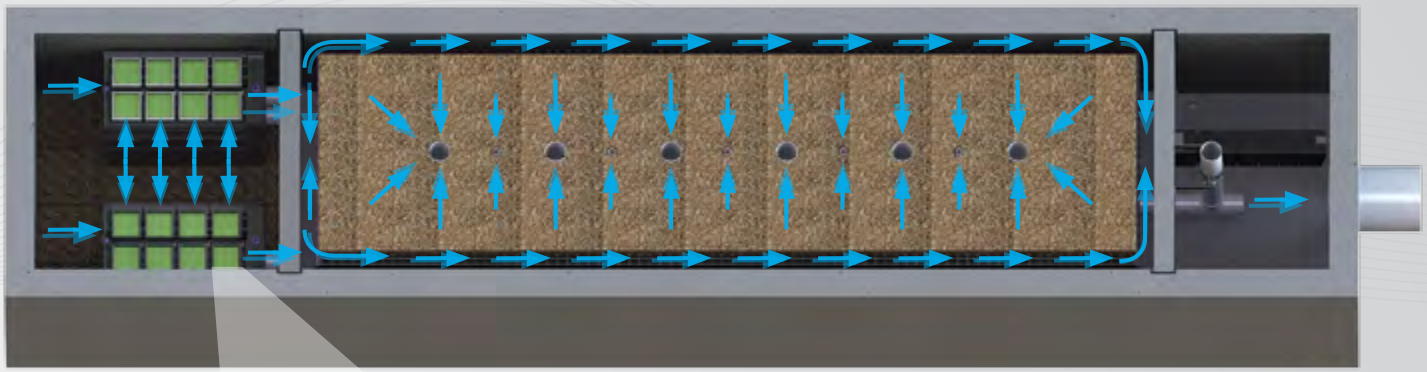


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.

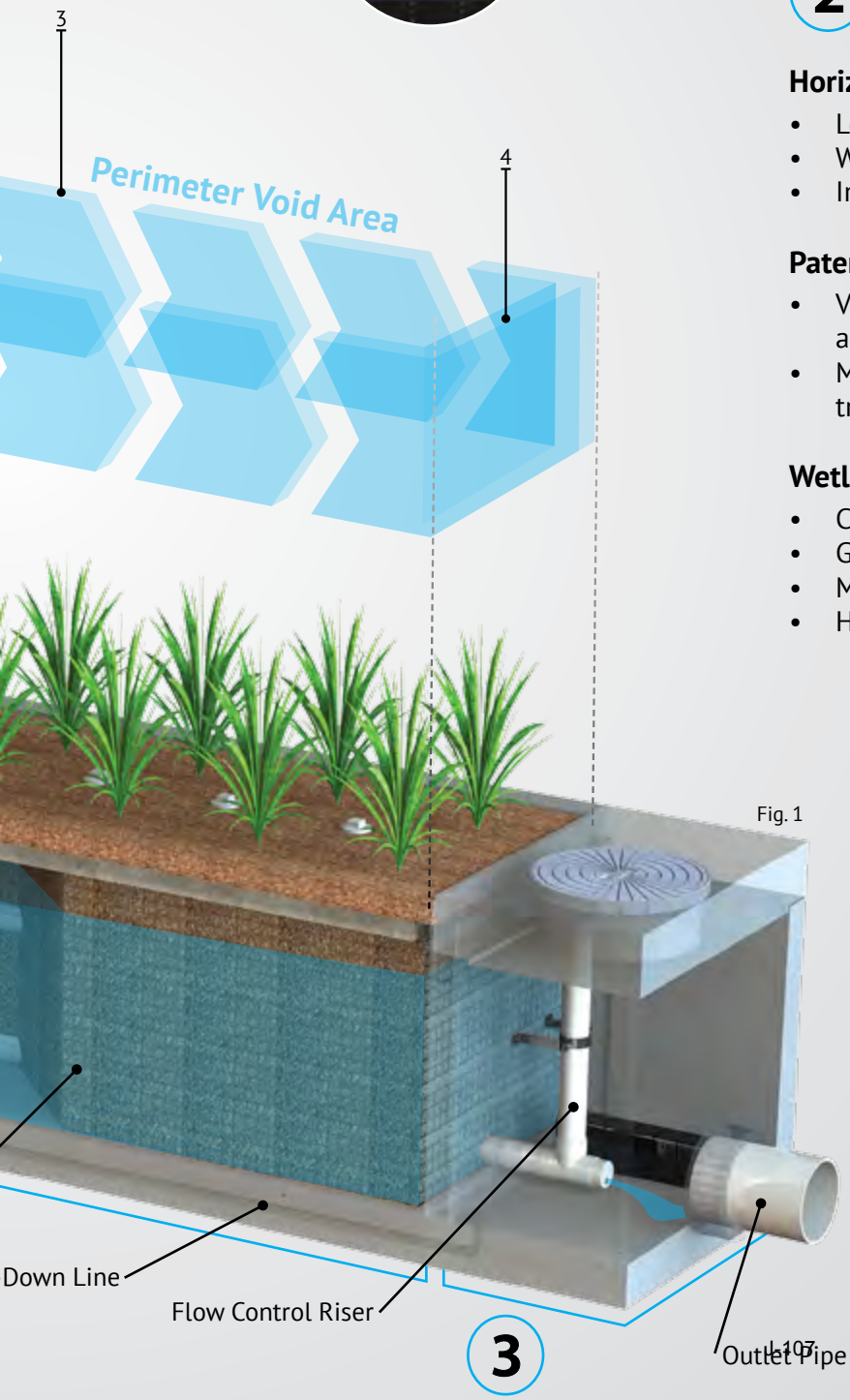


Fig. 1

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

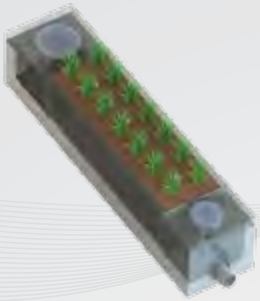
Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations

Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

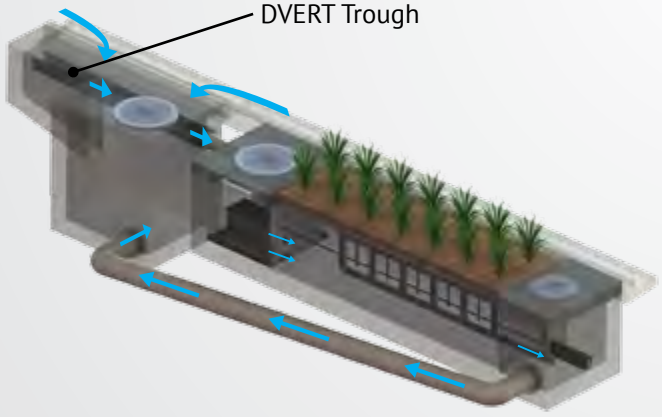
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.

Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With it's advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses natures ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.

Washington State DOE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%

DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.

MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.

Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

Flow Based Sizing

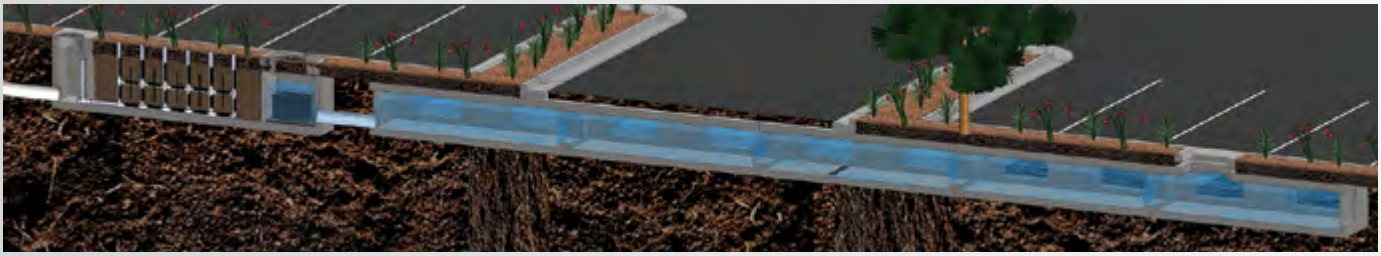
The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.

Plant Selection

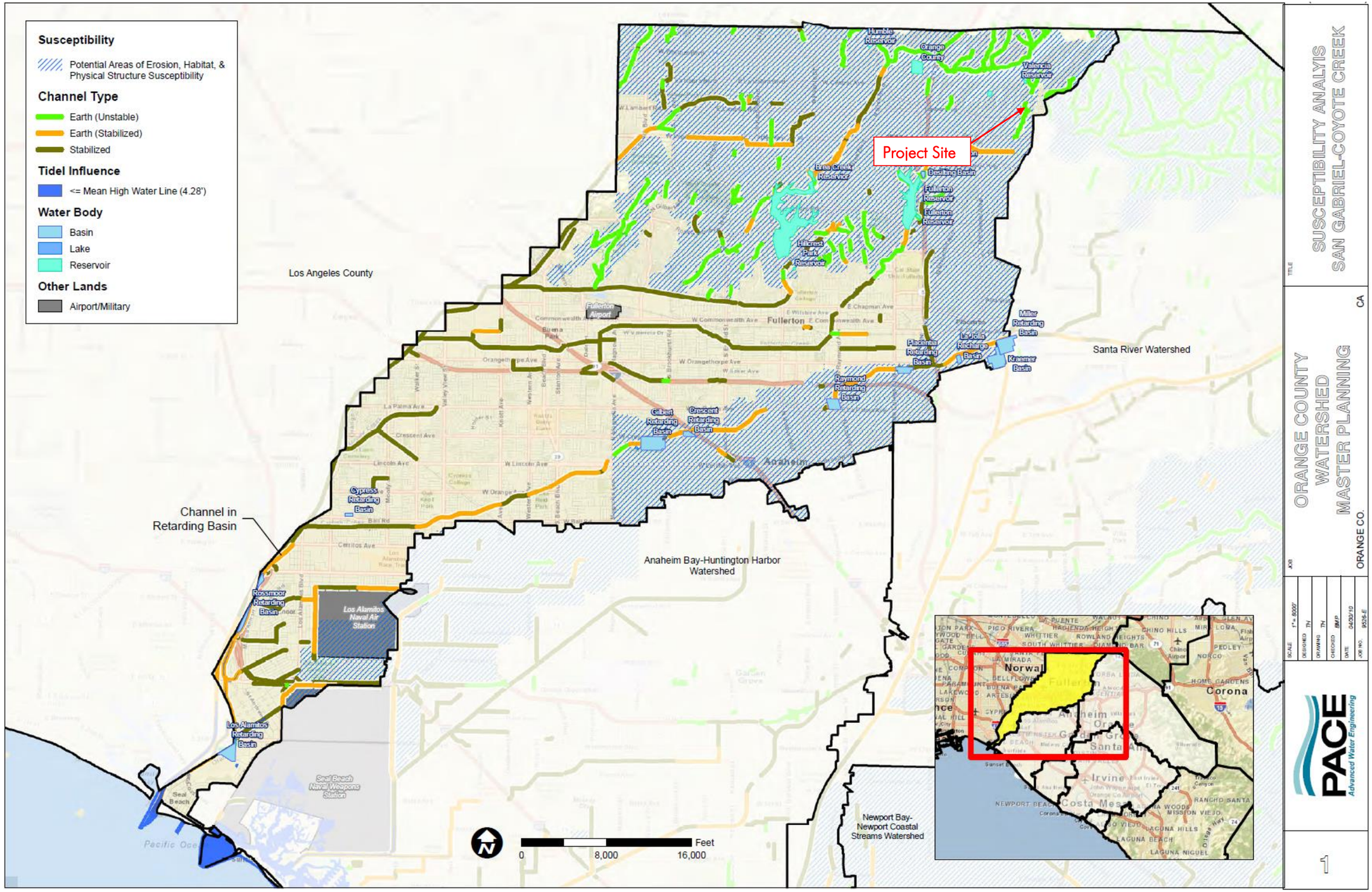
Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

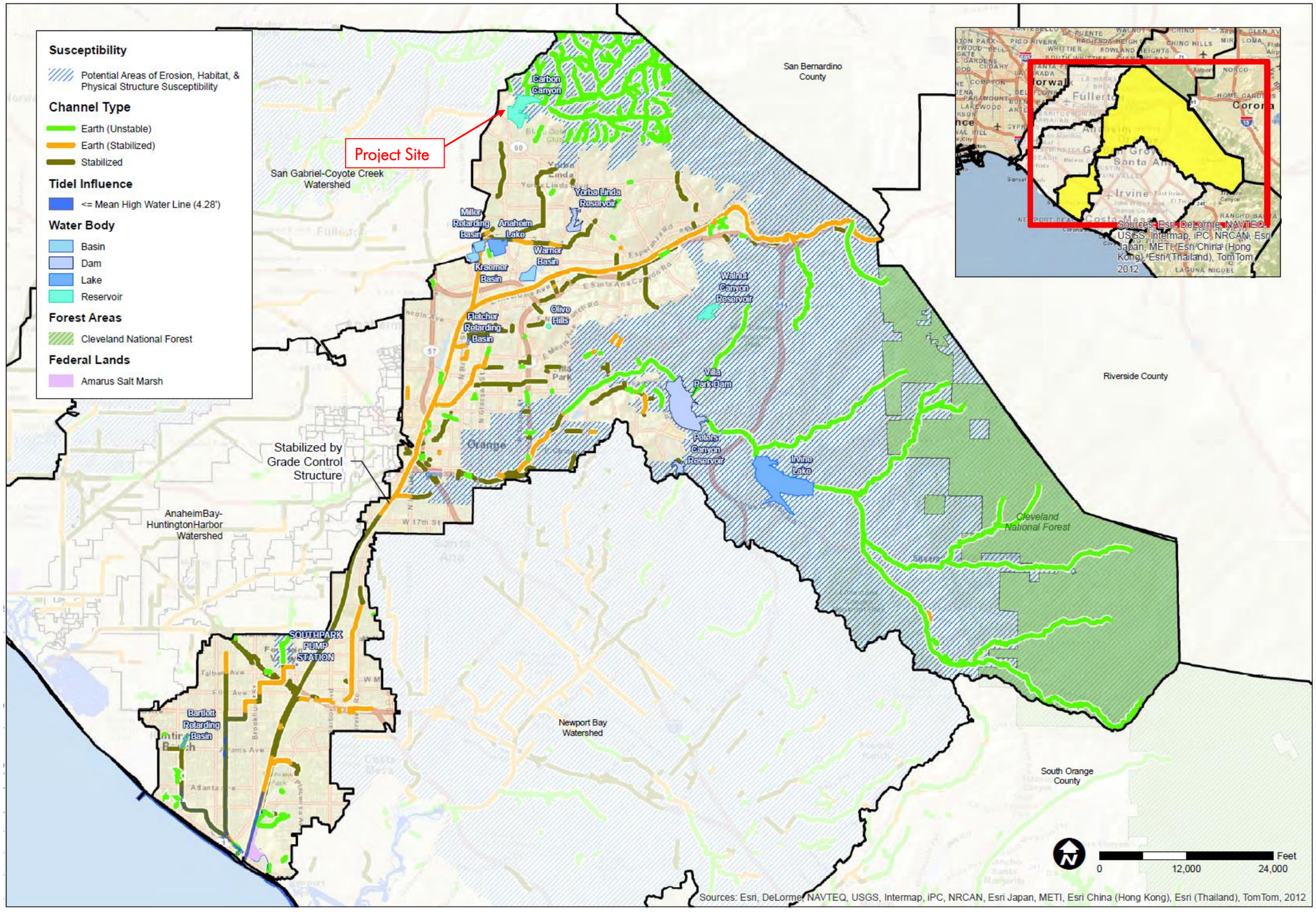
A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.

Attachment C – Hydromodification Analysis

(Incorporated by Reference. See project Hydrology Report)


Susceptibility
Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility
Channel Type
Earth (Unstable)
Earth (Stabilized)
Stabilized
Tidel Influence
<= Mean High Water Line (4.28')
Water Body
Basin
Lake
Reservoir
Other Lands
Airport/Military
Project Site
Los Angeles County
Santa River Watershed
Anaheim Bay-Huntington Harbor Watershed
Newport Bay-Newport Coastal Streams Watershed
Channel in Retarding Basin
Humble Reservoir
Orange County
Valencia Reservoir
Brea Creek Reservoir
Desilting Basin
Fullerton Reservoir
Fullerton Reservoir
Hillcrest Park Reservoir
Fullerton Airport
Fullerton
Miller Retarding Basin
La Jolla Recharge Basin
Placentia Retarding Basin
Kraemer Basin
Raymond Retarding Basin
Gilbert Retarding Basin
Crescent Retarding Basin
Cypress Retarding Basin
Rossmoor Retarding Basin
Los Alamitos Naval Air Station
Los Alamitos Retarding Basin
Seal Beach Naval Weapons Station
Seal Beach
Pacific Ocean
Anaheim
Norwalk
Corona
Irvine
Costa Mesa
Newport Beach
Laguna Beach
Laguna Hills
Laguna Niguel
0
8,000
16,000
Feet
SUSCEPTIBILITY ANALYIS
SAN GABRIEL-COYOTE CREEK
ORANGE COUNTY
WATERSHED
MASTER PLANNING
ORANGE CO.
CA
PACE
Advanced Water Engineering


Susceptibility
Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility
Channel Type
Earth (Unstable)
Earth (Stabilized)
Stabilized
Tidel Influence
<= Mean High Water Line (4.28')
Water Body
Basin
Dam
Lake
Reservoir
Forest Areas
Cleveland National Forest
Federal Lands
Amarus Salt Marsh
Project Site
San Gabriel-Coyote Creek Watershed
San Bernardino County
Carbon Canyon
Yorba Linda Reservoir
Miller Retarding Basin
Anaheim Lake
Warner Basin
Kraemer Basin
Walnut Canyon Reservoir
Olive Hills
Fletcher Retarding Basin
Villa Park Dam
Orange
Peters Canyon Reservoir
Irvine Lake
Riverside County
Cleveland National Forest
Stabilized by Grade Control Structure
AnaheimBay-HuntingtonHarbor Watershed
SOUTHPARK PUMP STATION
Bartlett Retarding Basin
Newport Bay Watershed
South Orange County
Feet
0
12,000
24,000
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012
SUSCEPTIBILITY ANALYIS
SANTA ANA RIVER
ORANGE COUNTY
WATERSHED
MASTER PLANNING
ORANGE CO.
CA
PACE
Advanced Water Engineering
FIGURE
3

W.O. #4213-3, BREA 265
1/14/2022

2-YR STUDY - WEST - AREAS 'A', 'B' & 'C'

FOR HYDRO-MODIFICATION DUE TO PART OF LOFTUS CHANNEL NOT IMPROVED

	EXISTING CONDITION			PROPOSED CONDITION			DIFFERENCES			
	A	B	C	A	B	C	A	B	C	
AREA (ac)	59.70	20.70	16.00	66.90	16.20	10.50	7.20	-4.50	-5.50	**AREA (ac)**
Q (cfs)	49.90	20.40	13.50	80.80	18.20	15.20	30.90	-2.20	1.70	**Q (cfs)**
Tc (min)	16.86	13.44	16.78	13.99	13.16	8.73	-2.87	-0.28	-8.05	**Tc (min)**
V (ac.ft)	1.97	0.76	0.55	8.12	1.69	1.40	6.15	0.93	0.85	**V (ac.ft)**

2-YR STUDY

HYDROLOGY CALCULATIONS

EXISTING CONDITION

WEST - AREAS ‘A’, ‘B’ & ‘C’

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                        Planning * Engineering * Surveying
           Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* W.O. #4213-3X, BREA CENTRAL                                           *
* 2-YR STUDY                                                            *
* EXISTING - WEST - AREAS 'A', 'B' & 'C'                                *
 ************************************************************************

  FILE NAME: WEST-E.DAT
  TIME/DATE OF STUDY: 18:38 11/06/2021
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  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) I 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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    520.00  DOWNSTREAM(FEET) =    514.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.241
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.422
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "BARREN"                   D        1.11      0.20     1.000    83   11.24
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.22
  TOTAL AREA(ACRES) =      1.11   PEAK FLOW RATE(CFS) =      1.22

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

```
 FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    514.00  DOWNSTREAM(FEET) =    497.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   620.00   CHANNEL SLOPE =  0.0269
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.288
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    D        6.99      0.20     1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.65
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.87
 AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   2.12
 Tc(MIN.) =   13.36
 SUBAREA AREA(ACRES) =     6.99       SUBAREA RUNOFF(CFS) =    6.84
 EFFECTIVE AREA(ACRES) =      8.10     AREA-AVERAGED Fm(INCH/HR) =   0.20
 AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =        8.1         PEAK FLOW RATE(CFS) =       7.93

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   5.99
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     920.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   497.30  DOWNSTREAM(FEET) =   492.00
 FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN 132.0 INCH PIPE IS   4.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.27
 GIVEN PIPE DIAMETER(INCH) = 132.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.93
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   13.63
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1055.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    492.00  DOWNSTREAM(FEET) =    479.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   510.00   CHANNEL SLOPE =  0.0255
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.212
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    D       10.16      0.20     1.000    83
 COMMERCIAL                  D        1.06      0.20     0.100    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.915
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.12
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.96
 AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.22
 Tc(MIN.) =   14.86
 SUBAREA AREA(ACRES) =    11.22       SUBAREA RUNOFF(CFS) =   10.39
 EFFECTIVE AREA(ACRES) =     19.32     AREA-AVERAGED Fm(INCH/HR) =   0.19
 AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.95
```

```
  TOTAL AREA(ACRES) =       19.3         PEAK FLOW RATE(CFS) =      17.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.40   FLOW VELOCITY(FEET/SEC.) =   7.66
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1565.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    479.00  DOWNSTREAM(FEET) =    453.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   980.00   CHANNEL SLOPE =  0.0261
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.127
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    D       40.34      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.14
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   2.01
  Tc(MIN.) =   16.86
  SUBAREA AREA(ACRES) =    40.34       SUBAREA RUNOFF(CFS) =   33.64
  EFFECTIVE AREA(ACRES) =     59.66     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.98
  TOTAL AREA(ACRES) =       59.7         PEAK FLOW RATE(CFS) =      49.93

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   9.26
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    2545.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    524.00  DOWNSTREAM(FEET) =    517.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.311
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.980
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  D        0.25      0.20      0.100    57    6.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.25   PEAK FLOW RATE(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  517.00  DOWNSTREAM ELEVATION(FEET) =  497.50
  STREET LENGTH(FEET) =   980.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.06
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   11.72
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
  STREET FLOW TRAVEL TIME(MIN.) =   5.18   Tc(MIN.) =   11.49
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.404
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.69      0.20     0.100    57
  NATURAL POOR COVER
  "BARREN"                   D        5.71      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.903
  SUBAREA AREA(ACRES) =    6.40      SUBAREA RUNOFF(CFS) =    7.05
  EFFECTIVE AREA(ACRES) =      6.65    AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.87
  TOTAL AREA(ACRES) =        6.7        PEAK FLOW RATE(CFS) =       7.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  14.98
  FLOW VELOCITY(FEET/SEC.) =  3.63   DEPTH*VELOCITY(FT*FT/SEC.) =   1.40
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     13.00 =    1280.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   497.50  DOWNSTREAM(FEET) =   493.00
  FLOW LENGTH(FEET) =   300.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.36
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =   12.18
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     14.00 =    1580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.18
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.358
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.11      0.20     0.100    57
  NATURAL POOR COVER
  "BARREN"                   D        2.51      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.962
  SUBAREA AREA(ACRES) =    2.62      SUBAREA RUNOFF(CFS) =    2.75
  EFFECTIVE AREA(ACRES) =      9.27   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        9.3       PEAK FLOW RATE(CFS) =       9.83

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   493.00  DOWNSTREAM(FEET) =   484.00
  FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.83
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =   12.87
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     15.00 =    1960.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.87
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.316
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.19      0.20     0.100    57
  NATURAL POOR COVER
  "BARREN"                   D        8.58      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.981
  SUBAREA AREA(ACRES) =    8.77      SUBAREA RUNOFF(CFS) =    8.84
  EFFECTIVE AREA(ACRES) =     18.04   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.94
  TOTAL AREA(ACRES) =       18.0       PEAK FLOW RATE(CFS) =      18.31

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   484.00  DOWNSTREAM(FEET) =   483.00
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.90
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.31
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =   13.44
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     16.00 =    2160.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.283
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   D        2.69      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    2.69      SUBAREA RUNOFF(CFS) =    2.62
  EFFECTIVE AREA(ACRES) =     20.73   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.95
  TOTAL AREA(ACRES) =       20.7       PEAK FLOW RATE(CFS) =      20.42

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    508.50  DOWNSTREAM(FEET) =    503.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.337
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.976
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                D        0.29      0.20     0.100    57    6.34
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.29   PEAK FLOW RATE(CFS) =      0.51

******************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  61
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  503.50  DOWNSTREAM ELEVATION(FEET) =  498.50
  STREET LENGTH(FEET) =   270.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    4.95
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.12
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.45
  STREET FLOW TRAVEL TIME(MIN.) =   2.13   Tc(MIN.) =    8.46
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.673
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                D        0.25      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.37
  EFFECTIVE AREA(ACRES) =      0.54    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       0.80

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   5.41
  FLOW VELOCITY(FEET/SEC.) =  2.17   DEPTH*VELOCITY(FT*FT/SEC.) =   0.48
  LONGEST FLOWPATH FROM NODE     21.00 TO NODE     23.00 =     540.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    498.50  DOWNSTREAM(FEET) =    484.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   590.00   CHANNEL SLOPE =  0.0246
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.396
  SUBAREA LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    D        2.57      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.13
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   3.15
  Tc(MIN.) =   11.61
  SUBAREA AREA(ACRES) =     2.57       SUBAREA RUNOFF(CFS) =    2.77
  EFFECTIVE AREA(ACRES) =      3.11     AREA-AVERAGED Fm(INCH/HR) =   0.17
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.84
  TOTAL AREA(ACRES) =        3.1         PEAK FLOW RATE(CFS) =       3.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   3.53
  LONGEST FLOWPATH FROM NODE     21.00 TO NODE     24.00 =    1130.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     25.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    484.00  DOWNSTREAM(FEET) =    465.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   980.00   CHANNEL SLOPE =  0.0194
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.130
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                    D       12.90      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.16
  AVERAGE FLOW DEPTH(FEET) =   0.40   TRAVEL TIME(MIN.) =   5.17
  Tc(MIN.) =   16.78
  SUBAREA AREA(ACRES) =    12.90       SUBAREA RUNOFF(CFS) =   10.80
  EFFECTIVE AREA(ACRES) =     16.01     AREA-AVERAGED Fm(INCH/HR) =   0.19
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.97
  TOTAL AREA(ACRES) =       16.0         PEAK FLOW RATE(CFS) =      13.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.50   FLOW VELOCITY(FEET/SEC.) =   3.59
  LONGEST FLOWPATH FROM NODE     21.00 TO NODE     25.00 =    2110.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       16.0  TC(MIN.) =     16.78
  EFFECTIVE AREA(ACRES) =     16.01  AREA-AVERAGED Fm(INCH/HR)=  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.970
  PEAK FLOW RATE(CFS)   =      13.49
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                            Analysis prepared by:

                            HUNSAKER & ASSOCIATES
                                  Irvine,Inc
                        Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  BREA 265, 2-YR STUDY
  EXISTING CONDITION
  AREA 'A'
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         59.70       98.00       75.(AMC II)     0.200       0.035

    TOTAL AREA (Acres) =     59.70

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.196

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.965
==========================================================================
```

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

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                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                       Planning * Engineering * Surveying
            Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* BREA 265                                                              *
* 2-YR STUDY - EXISTING CONDITION - WEST                                *
* AREA 'A'                                                              *
 ************************************************************************

  FILE NAME: WE-A.DAT
  TIME/DATE OF STUDY: 10:26 01/14/2022


******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      59.700 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.223 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         STORM RETURN FREQUENCY =    2-YEAR
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.196
         LOW LOSS FRACTION = 0.965
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.19
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.40
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  0.53
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  0.89
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  1.22
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  2.05

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.997
          30-MINUTE FACTOR = 0.997
           1-HOUR FACTOR = 0.997
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  37.319



==============================================================================
                      UNIT HYDROGRAPH DETERMINATION

------------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
```

1	2.588	18.682
2	17.032	104.287
3	43.494	191.058
4	72.197	207.231
5	88.229	115.752
6	95.282	50.925
7	98.044	19.938
8	98.842	5.761
9	99.436	4.294
10	99.775	2.441
11	99.944	1.221
12	100.000	0.407

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 8.2280
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 1.9685

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	12.5	25.0	37.5	50.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0003	0.03	Q	.	.	.	.
0.333	0.0006	0.05	Q	.	.	.	.
0.417	0.0010	0.06	Q	.	.	.	.
0.500	0.0015	0.06	Q	.	.	.	.
0.583	0.0019	0.07	Q	.	.	.	.
0.667	0.0024	0.07	Q	.	.	.	.
0.750	0.0029	0.07	Q	.	.	.	.
0.833	0.0034	0.07	Q	.	.	.	.
0.917	0.0038	0.07	Q	.	.	.	.
1.000	0.0043	0.07	Q	.	.	.	.
1.083	0.0048	0.07	Q	.	.	.	.
1.167	0.0053	0.07	Q	.	.	.	.
1.250	0.0057	0.07	Q	.	.	.	.
1.333	0.0062	0.07	Q	.	.	.	.
1.417	0.0067	0.07	Q	.	.	.	.
1.500	0.0072	0.07	Q	.	.	.	.
1.583	0.0077	0.07	Q	.	.	.	.
1.667	0.0082	0.07	Q	.	.	.	.
1.750	0.0087	0.07	Q	.	.	.	.
1.833	0.0092	0.07	Q	.	.	.	.
1.917	0.0097	0.07	Q	.	.	.	.
2.000	0.0102	0.07	Q	.	.	.	.
2.083	0.0107	0.07	Q	.	.	.	.
2.167	0.0112	0.07	Q	.	.	.	.
2.250	0.0117	0.07	Q	.	.	.	.
2.333	0.0122	0.07	Q	.	.	.	.
2.417	0.0127	0.07	Q	.	.	.	.
2.500	0.0132	0.07	Q	.	.	.	.
2.583	0.0137	0.07	Q	.	.	.	.
2.667	0.0142	0.07	Q	.	.	.	.
2.750	0.0147	0.07	Q	.	.	.	.
2.833	0.0152	0.07	Q	.	.	.	.
2.917	0.0158	0.08	Q	.	.	.	.
3.000	0.0163	0.08	Q	.	.	.	.
3.083	0.0168	0.08	Q	.	.	.	.
3.167	0.0173	0.08	Q	.	.	.	.
3.250	0.0178	0.08	Q	.	.	.	.
3.333	0.0184	0.08	Q	.	.	.	.
3.417	0.0189	0.08	Q	.	.	.	.
3.500	0.0194	0.08	Q	.	.	.	.
3.583	0.0200	0.08	Q	.	.	.	.
3.667	0.0205	0.08	Q	.	.	.	.
3.750	0.0211	0.08	Q	.	.	.	.
3.833	0.0216	0.08	Q	.	.	.	.
3.917	0.0221	0.08	Q	.	.	.	.
4.000	0.0227	0.08	Q	.	.	.	.
4.083	0.0232	0.08	Q	.	.	.	.
4.167	0.0238	0.08	Q	.	.	.	.
4.250	0.0243	0.08	Q	.	.	.	.
4.333	0.0249	0.08	Q	.	.	.	.
4.417	0.0255	0.08	Q	.	.	.	.
4.500	0.0260	0.08	Q	.	.	.	.
4.583	0.0266	0.08	Q	.	.	.	.
4.667	0.0271	0.08	Q	.	.	.	.
4.750	0.0277	0.08	Q	.	.	.	.
4.833	0.0283	0.08	Q	.	.	.	.
4.917	0.0289	0.08	Q	.	.	.	.
5.000	0.0294	0.08	Q	.	.	.	.

5.083	0.0300	0.08	Q	.	.	.	.
5.167	0.0306	0.08	Q	.	.	.	.
5.250	0.0312	0.08	Q	.	.	.	.
5.333	0.0318	0.09	Q	.	.	.	.
5.417	0.0324	0.09	Q	.	.	.	.
5.500	0.0330	0.09	Q	.	.	.	.
5.583	0.0335	0.09	Q	.	.	.	.
5.667	0.0341	0.09	Q	.	.	.	.
5.750	0.0347	0.09	Q	.	.	.	.
5.833	0.0354	0.09	Q	.	.	.	.
5.917	0.0360	0.09	Q	.	.	.	.
6.000	0.0366	0.09	Q	.	.	.	.
6.083	0.0372	0.09	Q	.	.	.	.
6.167	0.0378	0.09	Q	.	.	.	.
6.250	0.0384	0.09	Q	.	.	.	.
6.333	0.0390	0.09	Q	.	.	.	.
6.417	0.0397	0.09	Q	.	.	.	.
6.500	0.0403	0.09	Q	.	.	.	.
6.583	0.0409	0.09	Q	.	.	.	.
6.667	0.0416	0.09	Q	.	.	.	.
6.750	0.0422	0.09	Q	.	.	.	.
6.833	0.0429	0.09	Q	.	.	.	.
6.917	0.0435	0.09	Q	.	.	.	.
7.000	0.0442	0.09	Q	.	.	.	.
7.083	0.0448	0.10	Q	.	.	.	.
7.167	0.0455	0.10	Q	.	.	.	.
7.250	0.0461	0.10	Q	.	.	.	.
7.333	0.0468	0.10	Q	.	.	.	.
7.417	0.0475	0.10	Q	.	.	.	.
7.500	0.0481	0.10	Q	.	.	.	.
7.583	0.0488	0.10	Q	.	.	.	.
7.667	0.0495	0.10	QV	.	.	.	.
7.750	0.0502	0.10	QV	.	.	.	.
7.833	0.0509	0.10	QV	.	.	.	.
7.917	0.0516	0.10	QV	.	.	.	.
8.000	0.0523	0.10	QV	.	.	.	.
8.083	0.0530	0.10	QV	.	.	.	.
8.167	0.0537	0.10	QV	.	.	.	.
8.250	0.0544	0.10	QV	.	.	.	.
8.333	0.0551	0.10	QV	.	.	.	.
8.417	0.0558	0.10	QV	.	.	.	.
8.500	0.0566	0.11	QV	.	.	.	.
8.583	0.0573	0.11	QV	.	.	.	.
8.667	0.0580	0.11	QV	.	.	.	.
8.750	0.0588	0.11	QV	.	.	.	.
8.833	0.0595	0.11	QV	.	.	.	.
8.917	0.0603	0.11	QV	.	.	.	.
9.000	0.0610	0.11	QV	.	.	.	.
9.083	0.0618	0.11	QV	.	.	.	.
9.167	0.0626	0.11	QV	.	.	.	.
9.250	0.0633	0.11	QV	.	.	.	.
9.333	0.0641	0.11	QV	.	.	.	.
9.417	0.0649	0.11	QV	.	.	.	.
9.500	0.0657	0.11	QV	.	.	.	.
9.583	0.0665	0.12	QV	.	.	.	.
9.667	0.0673	0.12	QV	.	.	.	.
9.750	0.0681	0.12	QV	.	.	.	.
9.833	0.0689	0.12	QV	.	.	.	.
9.917	0.0697	0.12	QV	.	.	.	.
10.000	0.0706	0.12	QV	.	.	.	.
10.083	0.0714	0.12	QV	.	.	.	.
10.167	0.0723	0.12	QV	.	.	.	.
10.250	0.0731	0.12	QV	.	.	.	.
10.333	0.0740	0.12	QV	.	.	.	.
10.417	0.0748	0.13	QV	.	.	.	.
10.500	0.0757	0.13	QV	.	.	.	.
10.583	0.0766	0.13	QV	.	.	.	.
10.667	0.0775	0.13	QV	.	.	.	.
10.750	0.0784	0.13	QV	.	.	.	.
10.833	0.0793	0.13	QV	.	.	.	.
10.917	0.0802	0.13	QV	.	.	.	.

11.000	0.0811	0.13	QV	.	.	.	.
11.083	0.0821	0.14	QV	.	.	.	.
11.167	0.0830	0.14	QV	.	.	.	.
11.250	0.0840	0.14	QV	.	.	.	.
11.333	0.0849	0.14	QV	.	.	.	.
11.417	0.0859	0.14	QV	.	.	.	.
11.500	0.0869	0.14	QV	.	.	.	.
11.583	0.0879	0.14	QV	.	.	.	.
11.667	0.0889	0.15	QV	.	.	.	.
11.750	0.0899	0.15	QV	.	.	.	.
11.833	0.0909	0.15	QV	.	.	.	.
11.917	0.0920	0.15	QV	.	.	.	.
12.000	0.0930	0.15	QV	.	.	.	.
12.083	0.0941	0.16	QV	.	.	.	.
12.167	0.0952	0.16	QV	.	.	.	.
12.250	0.0964	0.17	QV	.	.	.	.
12.333	0.0977	0.19	QV	.	.	.	.
12.417	0.0990	0.19	Q V	.	.	.	.
12.500	0.1004	0.20	Q V	.	.	.	.
12.583	0.1018	0.20	Q V	.	.	.	.
12.667	0.1032	0.20	Q V	.	.	.	.
12.750	0.1046	0.21	Q V	.	.	.	.
12.833	0.1061	0.21	Q V	.	.	.	.
12.917	0.1076	0.21	Q V	.	.	.	.
13.000	0.1090	0.22	Q V	.	.	.	.
13.083	0.1106	0.22	Q V	.	.	.	.
13.167	0.1121	0.22	Q V	.	.	.	.
13.250	0.1136	0.23	Q V	.	.	.	.
13.333	0.1152	0.23	Q V	.	.	.	.
13.417	0.1168	0.23	Q V	.	.	.	.
13.500	0.1185	0.24	Q V	.	.	.	.
13.583	0.1201	0.24	Q V	.	.	.	.
13.667	0.1218	0.24	Q V	.	.	.	.
13.750	0.1235	0.25	Q V	.	.	.	.
13.833	0.1253	0.25	Q V	.	.	.	.
13.917	0.1270	0.26	Q V	.	.	.	.
14.000	0.1288	0.26	Q V	.	.	.	.
14.083	0.1307	0.27	Q V	.	.	.	.
14.167	0.1326	0.28	Q V	.	.	.	.
14.250	0.1346	0.29	Q V	.	.	.	.
14.333	0.1366	0.30	Q V	.	.	.	.
14.417	0.1387	0.30	Q V	.	.	.	.
14.500	0.1408	0.31	Q V	.	.	.	.
14.583	0.1431	0.32	Q V	.	.	.	.
14.667	0.1453	0.33	Q V	.	.	.	.
14.750	0.1477	0.34	Q V	.	.	.	.
14.833	0.1501	0.35	Q V	.	.	.	.
14.917	0.1525	0.36	Q V	.	.	.	.
15.000	0.1551	0.37	Q V	.	.	.	.
15.083	0.1578	0.39	Q V	.	.	.	.
15.167	0.1607	0.43	Q V	.	.	.	.
15.250	0.1646	0.56	Q V	.	.	.	.
15.333	0.1705	0.86	Q V	.	.	.	.
15.417	0.1793	1.28	.Q V	.	.	.	.
15.500	0.1906	1.64	.Q V	.	.	.	.
15.583	0.2035	1.88	.Q V	.	.	.	.
15.667	0.2191	2.27	.Q V	.	.	.	.
15.750	0.2410	3.17	. Q V	.	.	.	.
15.833	0.2737	4.75	. Q V	.	.	.	.
15.917	0.3227	7.11	. QV	.	.	.	.
16.000	0.3986	11.02	. Q	.	.	.	.
16.083	0.5313	19.27	. V Q	.	.	.	.
16.167	0.7820	36.41	. V	.	. Q.	.	.
16.250	1.1256	49.89	.	.	. V	.	Q.
16.333	1.4596	48.49	.	.	.	V.	Q .
16.417	1.6662	30.01	.	.	. Q	. V	.
16.500	1.7748	15.76	.	. Q	.	.	V .
16.583	1.8297	7.97	. Q	.	.	.	V .
16.667	1.8571	3.98	. Q	.	.	.	V .
16.750	1.8742	2.48	.Q	.	.	.	V .
16.833	1.8841	1.44	.Q	.	.	.	V .

16.917	1.8900	0.86	Q	.	.	.	V .
17.000	1.8937	0.54	Q	.	.	.	V .
17.083	1.8964	0.39	Q	.	.	.	V .
17.167	1.8988	0.34	Q	.	.	.	V .
17.250	1.9009	0.31	Q	.	.	.	V .
17.333	1.9029	0.29	Q	.	.	.	V .
17.417	1.9048	0.27	Q	.	.	.	V .
17.500	1.9066	0.26	Q	.	.	.	V .
17.583	1.9083	0.25	Q	.	.	.	V .
17.667	1.9100	0.24	Q	.	.	.	V .
17.750	1.9116	0.23	Q	.	.	.	V .
17.833	1.9131	0.23	Q	.	.	.	V .
17.917	1.9146	0.22	Q	.	.	.	V .
18.000	1.9161	0.21	Q	.	.	.	V .
18.083	1.9175	0.21	Q	.	.	.	V .
18.167	1.9189	0.20	Q	.	.	.	V .
18.250	1.9202	0.18	Q	.	.	.	V.
18.333	1.9213	0.17	Q	.	.	.	V.
18.417	1.9224	0.16	Q	.	.	.	V.
18.500	1.9235	0.15	Q	.	.	.	V.
18.583	1.9245	0.15	Q	.	.	.	V.
18.667	1.9255	0.15	Q	.	.	.	V.
18.750	1.9265	0.14	Q	.	.	.	V.
18.833	1.9274	0.14	Q	.	.	.	V.
18.917	1.9284	0.14	Q	.	.	.	V.
19.000	1.9293	0.13	Q	.	.	.	V.
19.083	1.9302	0.13	Q	.	.	.	V.
19.167	1.9311	0.13	Q	.	.	.	V.
19.250	1.9320	0.13	Q	.	.	.	V.
19.333	1.9328	0.12	Q	.	.	.	V.
19.417	1.9336	0.12	Q	.	.	.	V.
19.500	1.9345	0.12	Q	.	.	.	V.
19.583	1.9353	0.12	Q	.	.	.	V.
19.667	1.9361	0.12	Q	.	.	.	V.
19.750	1.9369	0.11	Q	.	.	.	V.
19.833	1.9376	0.11	Q	.	.	.	V.
19.917	1.9384	0.11	Q	.	.	.	V.
20.000	1.9392	0.11	Q	.	.	.	V.
20.083	1.9399	0.11	Q	.	.	.	V.
20.167	1.9406	0.11	Q	.	.	.	V.
20.250	1.9414	0.10	Q	.	.	.	V.
20.333	1.9421	0.10	Q	.	.	.	V.
20.417	1.9428	0.10	Q	.	.	.	V.
20.500	1.9435	0.10	Q	.	.	.	V.
20.583	1.9441	0.10	Q	.	.	.	V.
20.667	1.9448	0.10	Q	.	.	.	V.
20.750	1.9455	0.10	Q	.	.	.	V.
20.833	1.9462	0.10	Q	.	.	.	V.
20.917	1.9468	0.10	Q	.	.	.	V.
21.000	1.9475	0.09	Q	.	.	.	V.
21.083	1.9481	0.09	Q	.	.	.	V.
21.167	1.9487	0.09	Q	.	.	.	V.
21.250	1.9494	0.09	Q	.	.	.	V.
21.333	1.9500	0.09	Q	.	.	.	V.
21.417	1.9506	0.09	Q	.	.	.	V.
21.500	1.9512	0.09	Q	.	.	.	V.
21.583	1.9518	0.09	Q	.	.	.	V.
21.667	1.9524	0.09	Q	.	.	.	V.
21.750	1.9530	0.09	Q	.	.	.	V.
21.833	1.9536	0.08	Q	.	.	.	V.
21.917	1.9542	0.08	Q	.	.	.	V.
22.000	1.9547	0.08	Q	.	.	.	V.
22.083	1.9553	0.08	Q	.	.	.	V.
22.167	1.9559	0.08	Q	.	.	.	V.
22.250	1.9564	0.08	Q	.	.	.	V.
22.333	1.9570	0.08	Q	.	.	.	V.
22.417	1.9575	0.08	Q	.	.	.	V.
22.500	1.9581	0.08	Q	.	.	.	V.
22.583	1.9586	0.08	Q	.	.	.	V.
22.667	1.9591	0.08	Q	.	.	.	V.
22.750	1.9597	0.08	Q	.	.	.	V.

22.833	1.9602	0.08	Q	.	.	.	V.
22.917	1.9607	0.08	Q	.	.	.	V.
23.000	1.9612	0.08	Q	.	.	.	V.
23.083	1.9618	0.07	Q	.	.	.	V.
23.167	1.9623	0.07	Q	.	.	.	V.
23.250	1.9628	0.07	Q	.	.	.	V.
23.333	1.9633	0.07	Q	.	.	.	V.
23.417	1.9638	0.07	Q	.	.	.	V.
23.500	1.9643	0.07	Q	.	.	.	V.
23.583	1.9648	0.07	Q	.	.	.	V.
23.667	1.9653	0.07	Q	.	.	.	V.
23.750	1.9657	0.07	Q	.	.	.	V.
23.833	1.9662	0.07	Q	.	.	.	V.
23.917	1.9667	0.07	Q	.	.	.	V.
24.000	1.9672	0.07	Q	.	.	.	V.
24.083	1.9676	0.07	Q	.	.	.	V.
24.167	1.9680	0.06	Q	.	.	.	V.
24.250	1.9683	0.04	Q	.	.	.	V.
24.333	1.9684	0.02	Q	.	.	.	V.
24.417	1.9685	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1465.0
10%	45.0
20%	35.0
30%	30.0
40%	20.0
50%	20.0
60%	20.0
70%	15.0
80%	10.0
90%	10.0

END OF FLOODSCx ROUTING ANALYSIS

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                            Analysis prepared by:

                            HUNSAKER & ASSOCIATES
                                  Irvine,Inc
                        Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  BREA 265, 2-YR STUDY
  EXISTING CONDITION
  AREA 'B'
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         20.70       95.00       75.(AMC II)     0.200       0.061

    TOTAL AREA (Acres) =     20.70

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.190

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.939
==========================================================================
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**************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S
             USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
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                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                     Planning * Engineering * Surveying
           Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* BREA 265                                                              *
* 2-YR STUDY - EXISTING CONDITION - WEST                                *
* AREA 'B'                                                              *
 ************************************************************************

  FILE NAME: WE-B.DAT
  TIME/DATE OF STUDY: 10:49 01/14/2022


**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      20.700 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.185 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         STORM RETURN FREQUENCY =    2-YEAR
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.190
         LOW LOSS FRACTION = 0.939
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.19
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.40
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  0.53
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  0.89
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  1.22
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  2.05

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  44.996



==========================================================================
                      UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
```

1	3.625	9.074
2	24.314	51.794
3	59.212	87.363
4	84.735	63.896
5	94.844	25.305
6	98.167	8.321
7	99.078	2.279
8	99.631	1.385
9	99.908	0.693
10	100.000	0.231

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2.7732
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.7625

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	7.5	15.0	22.5	30.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0001	0.01	Q	.	.	.	.
0.250	0.0002	0.02	Q	.	.	.	.
0.333	0.0005	0.03	Q	.	.	.	.
0.417	0.0008	0.04	Q	.	.	.	.
0.500	0.0010	0.04	Q	.	.	.	.
0.583	0.0013	0.04	Q	.	.	.	.
0.667	0.0016	0.04	Q	.	.	.	.
0.750	0.0019	0.04	Q	.	.	.	.
0.833	0.0022	0.04	Q	.	.	.	.
0.917	0.0025	0.04	Q	.	.	.	.
1.000	0.0027	0.04	Q	.	.	.	.
1.083	0.0030	0.04	Q	.	.	.	.
1.167	0.0033	0.04	Q	.	.	.	.
1.250	0.0036	0.04	Q	.	.	.	.
1.333	0.0039	0.04	Q	.	.	.	.
1.417	0.0042	0.04	Q	.	.	.	.
1.500	0.0045	0.04	Q	.	.	.	.
1.583	0.0048	0.04	Q	.	.	.	.
1.667	0.0051	0.04	Q	.	.	.	.
1.750	0.0054	0.04	Q	.	.	.	.
1.833	0.0057	0.04	Q	.	.	.	.
1.917	0.0060	0.04	Q	.	.	.	.
2.000	0.0063	0.04	Q	.	.	.	.
2.083	0.0066	0.04	Q	.	.	.	.
2.167	0.0069	0.04	Q	.	.	.	.
2.250	0.0072	0.04	Q	.	.	.	.
2.333	0.0075	0.04	Q	.	.	.	.
2.417	0.0078	0.04	Q	.	.	.	.
2.500	0.0081	0.04	Q	.	.	.	.
2.583	0.0084	0.04	Q	.	.	.	.
2.667	0.0087	0.05	Q	.	.	.	.
2.750	0.0090	0.05	Q	.	.	.	.
2.833	0.0094	0.05	Q	.	.	.	.
2.917	0.0097	0.05	Q	.	.	.	.
3.000	0.0100	0.05	Q	.	.	.	.
3.083	0.0103	0.05	Q	.	.	.	.
3.167	0.0106	0.05	Q	.	.	.	.
3.250	0.0109	0.05	Q	.	.	.	.
3.333	0.0113	0.05	Q	.	.	.	.
3.417	0.0116	0.05	Q	.	.	.	.
3.500	0.0119	0.05	Q	.	.	.	.
3.583	0.0122	0.05	Q	.	.	.	.
3.667	0.0126	0.05	Q	.	.	.	.
3.750	0.0129	0.05	Q	.	.	.	.
3.833	0.0132	0.05	Q	.	.	.	.
3.917	0.0135	0.05	Q	.	.	.	.
4.000	0.0139	0.05	Q	.	.	.	.
4.083	0.0142	0.05	Q	.	.	.	.
4.167	0.0145	0.05	Q	.	.	.	.
4.250	0.0149	0.05	Q	.	.	.	.
4.333	0.0152	0.05	Q	.	.	.	.
4.417	0.0155	0.05	Q	.	.	.	.
4.500	0.0159	0.05	Q	.	.	.	.
4.583	0.0162	0.05	Q	.	.	.	.
4.667	0.0166	0.05	Q	.	.	.	.
4.750	0.0169	0.05	Q	.	.	.	.
4.833	0.0173	0.05	Q	.	.	.	.
4.917	0.0176	0.05	Q	.	.	.	.
5.000	0.0180	0.05	Q	.	.	.	.

5.083	0.0183	0.05	Q	.	.	.	.
5.167	0.0187	0.05	Q	.	.	.	.
5.250	0.0190	0.05	Q	.	.	.	.
5.333	0.0194	0.05	QV	.	.	.	.
5.417	0.0197	0.05	QV	.	.	.	.
5.500	0.0201	0.05	QV	.	.	.	.
5.583	0.0204	0.05	QV	.	.	.	.
5.667	0.0208	0.05	QV	.	.	.	.
5.750	0.0212	0.05	QV	.	.	.	.
5.833	0.0215	0.05	QV	.	.	.	.
5.917	0.0219	0.05	QV	.	.	.	.
6.000	0.0223	0.05	QV	.	.	.	.
6.083	0.0227	0.05	QV	.	.	.	.
6.167	0.0230	0.05	QV	.	.	.	.
6.250	0.0234	0.05	QV	.	.	.	.
6.333	0.0238	0.05	QV	.	.	.	.
6.417	0.0242	0.06	QV	.	.	.	.
6.500	0.0245	0.06	QV	.	.	.	.
6.583	0.0249	0.06	QV	.	.	.	.
6.667	0.0253	0.06	QV	.	.	.	.
6.750	0.0257	0.06	QV	.	.	.	.
6.833	0.0261	0.06	QV	.	.	.	.
6.917	0.0265	0.06	QV	.	.	.	.
7.000	0.0269	0.06	QV	.	.	.	.
7.083	0.0273	0.06	QV	.	.	.	.
7.167	0.0277	0.06	QV	.	.	.	.
7.250	0.0281	0.06	QV	.	.	.	.
7.333	0.0285	0.06	QV	.	.	.	.
7.417	0.0289	0.06	QV	.	.	.	.
7.500	0.0293	0.06	QV	.	.	.	.
7.583	0.0297	0.06	QV	.	.	.	.
7.667	0.0301	0.06	QV	.	.	.	.
7.750	0.0305	0.06	QV	.	.	.	.
7.833	0.0309	0.06	QV	.	.	.	.
7.917	0.0314	0.06	QV	.	.	.	.
8.000	0.0318	0.06	QV	.	.	.	.
8.083	0.0322	0.06	QV	.	.	.	.
8.167	0.0326	0.06	QV	.	.	.	.
8.250	0.0331	0.06	QV	.	.	.	.
8.333	0.0335	0.06	QV	.	.	.	.
8.417	0.0340	0.06	QV	.	.	.	.
8.500	0.0344	0.06	QV	.	.	.	.
8.583	0.0348	0.06	QV	.	.	.	.
8.667	0.0353	0.06	QV	.	.	.	.
8.750	0.0357	0.07	QV	.	.	.	.
8.833	0.0362	0.07	QV	.	.	.	.
8.917	0.0366	0.07	QV	.	.	.	.
9.000	0.0371	0.07	QV	.	.	.	.
9.083	0.0376	0.07	QV	.	.	.	.
9.167	0.0380	0.07	QV	.	.	.	.
9.250	0.0385	0.07	Q V	.	.	.	.
9.333	0.0390	0.07	Q V	.	.	.	.
9.417	0.0394	0.07	Q V	.	.	.	.
9.500	0.0399	0.07	Q V	.	.	.	.
9.583	0.0404	0.07	Q V	.	.	.	.
9.667	0.0409	0.07	Q V	.	.	.	.
9.750	0.0414	0.07	Q V	.	.	.	.
9.833	0.0419	0.07	Q V	.	.	.	.
9.917	0.0424	0.07	Q V	.	.	.	.
10.000	0.0429	0.07	Q V	.	.	.	.
10.083	0.0434	0.07	Q V	.	.	.	.
10.167	0.0439	0.07	Q V	.	.	.	.
10.250	0.0444	0.08	Q V	.	.	.	.
10.333	0.0449	0.08	Q V	.	.	.	.
10.417	0.0455	0.08	Q V	.	.	.	.
10.500	0.0460	0.08	Q V	.	.	.	.
10.583	0.0465	0.08	Q V	.	.	.	.
10.667	0.0471	0.08	Q V	.	.	.	.
10.750	0.0476	0.08	Q V	.	.	.	.
10.833	0.0482	0.08	Q V	.	.	.	.
10.917	0.0487	0.08	Q V	.	.	.	.

11.000	0.0493	0.08	Q V	.	.	.	.
11.083	0.0499	0.08	Q V	.	.	.	.
11.167	0.0504	0.08	Q V	.	.	.	.
11.250	0.0510	0.08	Q V	.	.	.	.
11.333	0.0516	0.08	Q V	.	.	.	.
11.417	0.0522	0.09	Q V	.	.	.	.
11.500	0.0528	0.09	Q V	.	.	.	.
11.583	0.0534	0.09	Q V	.	.	.	.
11.667	0.0540	0.09	Q V	.	.	.	.
11.750	0.0546	0.09	Q V	.	.	.	.
11.833	0.0553	0.09	Q V	.	.	.	.
11.917	0.0559	0.09	Q V	.	.	.	.
12.000	0.0565	0.09	Q V	.	.	.	.
12.083	0.0572	0.09	Q V	.	.	.	.
12.167	0.0579	0.10	Q V	.	.	.	.
12.250	0.0586	0.11	Q V	.	.	.	.
12.333	0.0594	0.12	Q V	.	.	.	.
12.417	0.0602	0.12	Q V	.	.	.	.
12.500	0.0611	0.12	Q V	.	.	.	.
12.583	0.0619	0.12	Q V	.	.	.	.
12.667	0.0628	0.12	Q V	.	.	.	.
12.750	0.0637	0.13	Q V	.	.	.	.
12.833	0.0645	0.13	Q V	.	.	.	.
12.917	0.0654	0.13	Q V	.	.	.	.
13.000	0.0663	0.13	Q V	.	.	.	.
13.083	0.0673	0.13	Q V	.	.	.	.
13.167	0.0682	0.14	Q V	.	.	.	.
13.250	0.0691	0.14	Q V	.	.	.	.
13.333	0.0701	0.14	Q V	.	.	.	.
13.417	0.0711	0.14	Q V	.	.	.	.
13.500	0.0721	0.14	Q V	.	.	.	.
13.583	0.0731	0.15	Q V	.	.	.	.
13.667	0.0741	0.15	Q V	.	.	.	.
13.750	0.0751	0.15	Q V	.	.	.	.
13.833	0.0762	0.15	Q V	.	.	.	.
13.917	0.0773	0.16	Q V	.	.	.	.
14.000	0.0784	0.16	Q V	.	.	.	.
14.083	0.0795	0.16	Q V	.	.	.	.
14.167	0.0807	0.17	Q V	.	.	.	.
14.250	0.0819	0.18	Q V	.	.	.	.
14.333	0.0831	0.18	Q V	.	.	.	.
14.417	0.0844	0.19	Q V	.	.	.	.
14.500	0.0857	0.19	Q V	.	.	.	.
14.583	0.0871	0.20	Q V	.	.	.	.
14.667	0.0885	0.20	Q V	.	.	.	.
14.750	0.0899	0.21	Q V	.	.	.	.
14.833	0.0914	0.21	Q V	.	.	.	.
14.917	0.0929	0.22	Q V	.	.	.	.
15.000	0.0944	0.23	Q V	.	.	.	.
15.083	0.0961	0.24	Q V	.	.	.	.
15.167	0.0979	0.26	Q V	.	.	.	.
15.250	0.1002	0.33	Q V	.	.	.	.
15.333	0.1034	0.47	Q V	.	.	.	.
15.417	0.1078	0.64	Q V	.	.	.	.
15.500	0.1129	0.75	Q V	.	.	.	.
15.583	0.1185	0.80	.Q V	.	.	.	.
15.667	0.1253	0.99	.Q V	.	.	.	.
15.750	0.1349	1.40	.Q V	.	.	.	.
15.833	0.1491	2.05	. Q V	.	.	.	.
15.917	0.1699	3.02	. Q V	.	.	.	.
16.000	0.2017	4.62	. Q V	.	.	.	.
16.083	0.2583	8.22	. Q V	.	.	.	.
16.167	0.3678	15.89	. .	V.Q	.	.	.
16.250	0.5086	20.44	. .	.	VQ	.	.
16.333	0.6128	15.14	. .	Q	.	V	.
16.417	0.6643	7.48	. Q.	.	.	V	.
16.500	0.6883	3.49	. Q .	.	.	V	.
16.583	0.7005	1.76	. Q .	.	.	V	.
16.667	0.7080	1.10	.Q .	.	.	V	.
16.750	0.7124	0.64	Q .	.	.	V	.
16.833	0.7150	0.38	Q .	.	.	V	.

16.917	0.7168	0.26	Q	.	.	.	V .
17.000	0.7183	0.22	Q	.	.	.	V .
17.083	0.7197	0.20	Q	.	.	.	V .
17.167	0.7211	0.19	Q	.	.	.	V .
17.250	0.7223	0.18	Q	.	.	.	V .
17.333	0.7234	0.17	Q	.	.	.	V .
17.417	0.7245	0.16	Q	.	.	.	V .
17.500	0.7256	0.15	Q	.	.	.	V .
17.583	0.7266	0.15	Q	.	.	.	V .
17.667	0.7276	0.14	Q	.	.	.	V .
17.750	0.7286	0.14	Q	.	.	.	V .
17.833	0.7295	0.13	Q	.	.	.	V .
17.917	0.7304	0.13	Q	.	.	.	V .
18.000	0.7313	0.13	Q	.	.	.	V .
18.083	0.7321	0.12	Q	.	.	.	V .
18.167	0.7329	0.12	Q	.	.	.	V .
18.250	0.7336	0.11	Q	.	.	.	V .
18.333	0.7343	0.10	Q	.	.	.	V .
18.417	0.7350	0.09	Q	.	.	.	V .
18.500	0.7356	0.09	Q	.	.	.	V .
18.583	0.7362	0.09	Q	.	.	.	V .
18.667	0.7368	0.09	Q	.	.	.	V .
18.750	0.7374	0.08	Q	.	.	.	V .
18.833	0.7380	0.08	Q	.	.	.	V .
18.917	0.7385	0.08	Q	.	.	.	V .
19.000	0.7391	0.08	Q	.	.	.	V .
19.083	0.7396	0.08	Q	.	.	.	V .
19.167	0.7401	0.08	Q	.	.	.	V .
19.250	0.7407	0.08	Q	.	.	.	V .
19.333	0.7412	0.07	Q	.	.	.	V .
19.417	0.7417	0.07	Q	.	.	.	V .
19.500	0.7422	0.07	Q	.	.	.	V .
19.583	0.7426	0.07	Q	.	.	.	V .
19.667	0.7431	0.07	Q	.	.	.	V .
19.750	0.7436	0.07	Q	.	.	.	V.
19.833	0.7441	0.07	Q	.	.	.	V.
19.917	0.7445	0.07	Q	.	.	.	V.
20.000	0.7450	0.07	Q	.	.	.	V.
20.083	0.7454	0.06	Q	.	.	.	V.
20.167	0.7459	0.06	Q	.	.	.	V.
20.250	0.7463	0.06	Q	.	.	.	V.
20.333	0.7467	0.06	Q	.	.	.	V.
20.417	0.7471	0.06	Q	.	.	.	V.
20.500	0.7476	0.06	Q	.	.	.	V.
20.583	0.7480	0.06	Q	.	.	.	V.
20.667	0.7484	0.06	Q	.	.	.	V.
20.750	0.7488	0.06	Q	.	.	.	V.
20.833	0.7492	0.06	Q	.	.	.	V.
20.917	0.7496	0.06	Q	.	.	.	V.
21.000	0.7500	0.06	Q	.	.	.	V.
21.083	0.7503	0.06	Q	.	.	.	V.
21.167	0.7507	0.06	Q	.	.	.	V.
21.250	0.7511	0.05	Q	.	.	.	V.
21.333	0.7515	0.05	Q	.	.	.	V.
21.417	0.7518	0.05	Q	.	.	.	V.
21.500	0.7522	0.05	Q	.	.	.	V.
21.583	0.7526	0.05	Q	.	.	.	V.
21.667	0.7529	0.05	Q	.	.	.	V.
21.750	0.7533	0.05	Q	.	.	.	V.
21.833	0.7536	0.05	Q	.	.	.	V.
21.917	0.7540	0.05	Q	.	.	.	V.
22.000	0.7543	0.05	Q	.	.	.	V.
22.083	0.7547	0.05	Q	.	.	.	V.
22.167	0.7550	0.05	Q	.	.	.	V.
22.250	0.7554	0.05	Q	.	.	.	V.
22.333	0.7557	0.05	Q	.	.	.	V.
22.417	0.7560	0.05	Q	.	.	.	V.
22.500	0.7563	0.05	Q	.	.	.	V.
22.583	0.7567	0.05	Q	.	.	.	V.
22.667	0.7570	0.05	Q	.	.	.	V.
22.750	0.7573	0.05	Q	.	.	.	V.

22.833	0.7576	0.05	Q	.	.	.	V.
22.917	0.7579	0.05	Q	.	.	.	V.
23.000	0.7583	0.05	Q	.	.	.	V.
23.083	0.7586	0.04	Q	.	.	.	V.
23.167	0.7589	0.04	Q	.	.	.	V.
23.250	0.7592	0.04	Q	.	.	.	V.
23.333	0.7595	0.04	Q	.	.	.	V.
23.417	0.7598	0.04	Q	.	.	.	V.
23.500	0.7601	0.04	Q	.	.	.	V.
23.583	0.7604	0.04	Q	.	.	.	V.
23.667	0.7607	0.04	Q	.	.	.	V.
23.750	0.7610	0.04	Q	.	.	.	V.
23.833	0.7613	0.04	Q	.	.	.	V.
23.917	0.7615	0.04	Q	.	.	.	V.
24.000	0.7618	0.04	Q	.	.	.	V.
24.083	0.7621	0.04	Q	.	.	.	V.
24.167	0.7623	0.03	Q	.	.	.	V.
24.250	0.7624	0.02	Q	.	.	.	V.
24.333	0.7625	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1460.0
10%	45.0
20%	30.0
30%	25.0
40%	20.0
50%	15.0
60%	15.0
70%	15.0
80%	5.0
90%	5.0

END OF FLOODSCx ROUTING ANALYSIS

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                            Analysis prepared by:

                            HUNSAKER & ASSOCIATES
                                  Irvine,Inc
                        Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  BREA 265, 2-YR STUDY
  EXISTING CONDITION
  AREA 'C'
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         16.00       97.00       75.(AMC II)     0.200       0.044

    TOTAL AREA (Acres) =     16.00

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.194

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.956
==========================================================================
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******************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S
             USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
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                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                     Planning * Engineering * Surveying
           Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* BREA 265                                                              *
* 2-YR STUDY - EXISTING CONDITION - WEST                                *
* AREA 'C'                                                              *
 ************************************************************************

  FILE NAME: WE-C.DAT
  TIME/DATE OF STUDY: 11:03 01/14/2022


******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      16.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.223 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         STORM RETURN FREQUENCY =    2-YEAR
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.194
         LOW LOSS FRACTION = 0.956
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.19
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.40
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  0.53
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  0.89
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  1.22
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  2.05

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  37.369



==============================================================================
                      UNIT HYDROGRAPH DETERMINATION

------------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
```

1	2.593	5.018
2	17.076	28.024
3	43.597	51.319
4	72.304	55.549
5	88.291	30.934
6	95.315	13.592
7	98.055	5.303
8	98.849	1.535
9	99.440	1.144
10	99.776	0.650
11	99.944	0.325
12	100.000	0.108

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2.1834
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 0.5496

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	5.0	10.0	15.0	20.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0000	0.00	Q	.	.	.	.
0.250	0.0001	0.01	Q	.	.	.	.
0.333	0.0002	0.02	Q	.	.	.	.
0.417	0.0004	0.02	Q	.	.	.	.
0.500	0.0005	0.02	Q	.	.	.	.
0.583	0.0007	0.02	Q	.	.	.	.
0.667	0.0008	0.02	Q	.	.	.	.
0.750	0.0010	0.02	Q	.	.	.	.
0.833	0.0011	0.02	Q	.	.	.	.
0.917	0.0013	0.02	Q	.	.	.	.
1.000	0.0015	0.02	Q	.	.	.	.
1.083	0.0016	0.02	Q	.	.	.	.
1.167	0.0018	0.02	Q	.	.	.	.
1.250	0.0019	0.02	Q	.	.	.	.
1.333	0.0021	0.02	Q	.	.	.	.
1.417	0.0023	0.02	Q	.	.	.	.
1.500	0.0024	0.02	Q	.	.	.	.
1.583	0.0026	0.02	Q	.	.	.	.
1.667	0.0028	0.02	Q	.	.	.	.
1.750	0.0029	0.02	Q	.	.	.	.
1.833	0.0031	0.02	Q	.	.	.	.
1.917	0.0033	0.02	Q	.	.	.	.
2.000	0.0034	0.02	Q	.	.	.	.
2.083	0.0036	0.02	Q	.	.	.	.
2.167	0.0038	0.02	Q	.	.	.	.
2.250	0.0039	0.02	Q	.	.	.	.
2.333	0.0041	0.02	Q	.	.	.	.
2.417	0.0043	0.02	Q	.	.	.	.
2.500	0.0044	0.02	Q	.	.	.	.
2.583	0.0046	0.02	Q	.	.	.	.
2.667	0.0048	0.03	Q	.	.	.	.
2.750	0.0050	0.03	Q	.	.	.	.
2.833	0.0051	0.03	Q	.	.	.	.
2.917	0.0053	0.03	Q	.	.	.	.
3.000	0.0055	0.03	Q	.	.	.	.
3.083	0.0057	0.03	Q	.	.	.	.
3.167	0.0058	0.03	Q	.	.	.	.
3.250	0.0060	0.03	Q	.	.	.	.
3.333	0.0062	0.03	Q	.	.	.	.
3.417	0.0064	0.03	Q	.	.	.	.
3.500	0.0066	0.03	Q	.	.	.	.
3.583	0.0067	0.03	Q	.	.	.	.
3.667	0.0069	0.03	Q	.	.	.	.
3.750	0.0071	0.03	Q	.	.	.	.
3.833	0.0073	0.03	Q	.	.	.	.
3.917	0.0075	0.03	Q	.	.	.	.
4.000	0.0076	0.03	Q	.	.	.	.
4.083	0.0078	0.03	Q	.	.	.	.
4.167	0.0080	0.03	Q	.	.	.	.
4.250	0.0082	0.03	Q	.	.	.	.
4.333	0.0084	0.03	Q	.	.	.	.
4.417	0.0086	0.03	Q	.	.	.	.
4.500	0.0088	0.03	Q	.	.	.	.
4.583	0.0090	0.03	Q	.	.	.	.
4.667	0.0091	0.03	Q	.	.	.	.
4.750	0.0093	0.03	Q	.	.	.	.
4.833	0.0095	0.03	Q	.	.	.	.
4.917	0.0097	0.03	Q	.	.	.	.
5.000	0.0099	0.03	Q	.	.	.	.

5.083	0.0101	0.03	Q	.	.	.	.
5.167	0.0103	0.03	Q	.	.	.	.
5.250	0.0105	0.03	Q	.	.	.	.
5.333	0.0107	0.03	Q	.	.	.	.
5.417	0.0109	0.03	Q	.	.	.	.
5.500	0.0111	0.03	Q	.	.	.	.
5.583	0.0113	0.03	Q	.	.	.	.
5.667	0.0115	0.03	Q	.	.	.	.
5.750	0.0117	0.03	Q	.	.	.	.
5.833	0.0119	0.03	Q	.	.	.	.
5.917	0.0121	0.03	Q	.	.	.	.
6.000	0.0123	0.03	Q	.	.	.	.
6.083	0.0125	0.03	Q	.	.	.	.
6.167	0.0127	0.03	Q	.	.	.	.
6.250	0.0129	0.03	Q	.	.	.	.
6.333	0.0132	0.03	Q	.	.	.	.
6.417	0.0134	0.03	Q	.	.	.	.
6.500	0.0136	0.03	Q	.	.	.	.
6.583	0.0138	0.03	QV	.	.	.	.
6.667	0.0140	0.03	QV	.	.	.	.
6.750	0.0142	0.03	QV	.	.	.	.
6.833	0.0144	0.03	QV	.	.	.	.
6.917	0.0147	0.03	QV	.	.	.	.
7.000	0.0149	0.03	QV	.	.	.	.
7.083	0.0151	0.03	QV	.	.	.	.
7.167	0.0153	0.03	QV	.	.	.	.
7.250	0.0155	0.03	QV	.	.	.	.
7.333	0.0158	0.03	QV	.	.	.	.
7.417	0.0160	0.03	QV	.	.	.	.
7.500	0.0162	0.03	QV	.	.	.	.
7.583	0.0164	0.03	QV	.	.	.	.
7.667	0.0167	0.03	QV	.	.	.	.
7.750	0.0169	0.03	QV	.	.	.	.
7.833	0.0171	0.03	QV	.	.	.	.
7.917	0.0174	0.03	QV	.	.	.	.
8.000	0.0176	0.03	QV	.	.	.	.
8.083	0.0178	0.03	QV	.	.	.	.
8.167	0.0181	0.03	QV	.	.	.	.
8.250	0.0183	0.03	QV	.	.	.	.
8.333	0.0186	0.04	QV	.	.	.	.
8.417	0.0188	0.04	QV	.	.	.	.
8.500	0.0191	0.04	QV	.	.	.	.
8.583	0.0193	0.04	QV	.	.	.	.
8.667	0.0196	0.04	QV	.	.	.	.
8.750	0.0198	0.04	QV	.	.	.	.
8.833	0.0201	0.04	QV	.	.	.	.
8.917	0.0203	0.04	QV	.	.	.	.
9.000	0.0206	0.04	QV	.	.	.	.
9.083	0.0208	0.04	QV	.	.	.	.
9.167	0.0211	0.04	QV	.	.	.	.
9.250	0.0213	0.04	QV	.	.	.	.
9.333	0.0216	0.04	QV	.	.	.	.
9.417	0.0219	0.04	QV	.	.	.	.
9.500	0.0221	0.04	QV	.	.	.	.
9.583	0.0224	0.04	QV	.	.	.	.
9.667	0.0227	0.04	QV	.	.	.	.
9.750	0.0229	0.04	QV	.	.	.	.
9.833	0.0232	0.04	QV	.	.	.	.
9.917	0.0235	0.04	QV	.	.	.	.
10.000	0.0238	0.04	QV	.	.	.	.
10.083	0.0241	0.04	QV	.	.	.	.
10.167	0.0243	0.04	QV	.	.	.	.
10.250	0.0246	0.04	QV	.	.	.	.
10.333	0.0249	0.04	QV	.	.	.	.
10.417	0.0252	0.04	QV	.	.	.	.
10.500	0.0255	0.04	QV	.	.	.	.
10.583	0.0258	0.04	QV	.	.	.	.
10.667	0.0261	0.04	QV	.	.	.	.
10.750	0.0264	0.04	QV	.	.	.	.
10.833	0.0267	0.04	QV	.	.	.	.
10.917	0.0270	0.04	QV	.	.	.	.

11.000	0.0273	0.05	QV	.	.	.	.
11.083	0.0276	0.05	Q V	.	.	.	.
11.167	0.0280	0.05	Q V	.	.	.	.
11.250	0.0283	0.05	Q V	.	.	.	.
11.333	0.0286	0.05	Q V	.	.	.	.
11.417	0.0289	0.05	Q V	.	.	.	.
11.500	0.0293	0.05	Q V	.	.	.	.
11.583	0.0296	0.05	Q V	.	.	.	.
11.667	0.0299	0.05	Q V	.	.	.	.
11.750	0.0303	0.05	Q V	.	.	.	.
11.833	0.0306	0.05	Q V	.	.	.	.
11.917	0.0310	0.05	Q V	.	.	.	.
12.000	0.0313	0.05	Q V	.	.	.	.
12.083	0.0317	0.05	Q V	.	.	.	.
12.167	0.0321	0.05	Q V	.	.	.	.
12.250	0.0325	0.06	Q V	.	.	.	.
12.333	0.0329	0.06	Q V	.	.	.	.
12.417	0.0334	0.07	Q V	.	.	.	.
12.500	0.0338	0.07	Q V	.	.	.	.
12.583	0.0343	0.07	Q V	.	.	.	.
12.667	0.0348	0.07	Q V	.	.	.	.
12.750	0.0353	0.07	Q V	.	.	.	.
12.833	0.0357	0.07	Q V	.	.	.	.
12.917	0.0362	0.07	Q V	.	.	.	.
13.000	0.0367	0.07	Q V	.	.	.	.
13.083	0.0372	0.07	Q V	.	.	.	.
13.167	0.0378	0.07	Q V	.	.	.	.
13.250	0.0383	0.08	Q V	.	.	.	.
13.333	0.0388	0.08	Q V	.	.	.	.
13.417	0.0394	0.08	Q V	.	.	.	.
13.500	0.0399	0.08	Q V	.	.	.	.
13.583	0.0405	0.08	Q V	.	.	.	.
13.667	0.0410	0.08	Q V	.	.	.	.
13.750	0.0416	0.08	Q V	.	.	.	.
13.833	0.0422	0.09	Q V	.	.	.	.
13.917	0.0428	0.09	Q V	.	.	.	.
14.000	0.0434	0.09	Q V	.	.	.	.
14.083	0.0440	0.09	Q V	.	.	.	.
14.167	0.0447	0.09	Q V	.	.	.	.
14.250	0.0453	0.10	Q V	.	.	.	.
14.333	0.0460	0.10	Q V	.	.	.	.
14.417	0.0467	0.10	Q V	.	.	.	.
14.500	0.0474	0.10	Q V	.	.	.	.
14.583	0.0482	0.11	Q V	.	.	.	.
14.667	0.0490	0.11	Q V	.	.	.	.
14.750	0.0497	0.11	Q V	.	.	.	.
14.833	0.0505	0.12	Q V	.	.	.	.
14.917	0.0514	0.12	Q V	.	.	.	.
15.000	0.0522	0.12	Q V	.	.	.	.
15.083	0.0531	0.13	Q V	.	.	.	.
15.167	0.0541	0.14	Q V	.	.	.	.
15.250	0.0553	0.18	Q V	.	.	.	.
15.333	0.0571	0.26	Q V	.	.	.	.
15.417	0.0597	0.37	Q V	.	.	.	.
15.500	0.0629	0.47	Q V	.	.	.	.
15.583	0.0666	0.54	.Q V	.	.	.	.
15.667	0.0710	0.64	.Q V	.	.	.	.
15.750	0.0771	0.89	.Q V	.	.	.	.
15.833	0.0862	1.31	. Q V	.	.	.	.
15.917	0.0996	1.95	. Q V	.	.	.	.
16.000	0.1203	3.00	. Q V	.	.	.	.
16.083	0.1562	5.22	. QV	.	.	.	.
16.167	0.2239	9.83	.	. V Q.	.	.	.
16.250	0.3166	13.45	.	.	. V Q	.	.
16.333	0.4065	13.06	.	.	. Q V.		.
16.417	0.4622	8.08	.	. Q	.	. V	.
16.500	0.4915	4.26	. Q	.	.	. V	.
16.583	0.5064	2.16	. Q	.	.	. V	.
16.667	0.5139	1.10	. Q	.	.	. V	.
16.750	0.5187	0.69	.Q	.	.	. V	.
16.833	0.5215	0.41	Q	.	.	. V	.

16.917	0.5233	0.26	Q	.	.	.	V .
17.000	0.5244	0.17	Q	.	.	.	V .
17.083	0.5253	0.13	Q	.	.	.	V .
17.167	0.5261	0.11	Q	.	.	.	V .
17.250	0.5268	0.10	Q	.	.	.	V .
17.333	0.5275	0.10	Q	.	.	.	V .
17.417	0.5281	0.09	Q	.	.	.	V .
17.500	0.5287	0.09	Q	.	.	.	V .
17.583	0.5293	0.08	Q	.	.	.	V .
17.667	0.5299	0.08	Q	.	.	.	V .
17.750	0.5304	0.08	Q	.	.	.	V .
17.833	0.5309	0.08	Q	.	.	.	V .
17.917	0.5314	0.07	Q	.	.	.	V .
18.000	0.5319	0.07	Q	.	.	.	V .
18.083	0.5324	0.07	Q	.	.	.	V .
18.167	0.5329	0.07	Q	.	.	.	V .
18.250	0.5333	0.06	Q	.	.	.	V .
18.333	0.5337	0.06	Q	.	.	.	V .
18.417	0.5341	0.05	Q	.	.	.	V .
18.500	0.5344	0.05	Q	.	.	.	V .
18.583	0.5348	0.05	Q	.	.	.	V .
18.667	0.5351	0.05	Q	.	.	.	V .
18.750	0.5354	0.05	Q	.	.	.	V .
18.833	0.5357	0.05	Q	.	.	.	V .
18.917	0.5361	0.05	Q	.	.	.	V.
19.000	0.5364	0.04	Q	.	.	.	V.
19.083	0.5367	0.04	Q	.	.	.	V.
19.167	0.5370	0.04	Q	.	.	.	V.
19.250	0.5373	0.04	Q	.	.	.	V.
19.333	0.5375	0.04	Q	.	.	.	V.
19.417	0.5378	0.04	Q	.	.	.	V.
19.500	0.5381	0.04	Q	.	.	.	V.
19.583	0.5384	0.04	Q	.	.	.	V.
19.667	0.5387	0.04	Q	.	.	.	V.
19.750	0.5389	0.04	Q	.	.	.	V.
19.833	0.5392	0.04	Q	.	.	.	V.
19.917	0.5394	0.04	Q	.	.	.	V.
20.000	0.5397	0.04	Q	.	.	.	V.
20.083	0.5399	0.04	Q	.	.	.	V.
20.167	0.5402	0.04	Q	.	.	.	V.
20.250	0.5404	0.04	Q	.	.	.	V.
20.333	0.5407	0.03	Q	.	.	.	V.
20.417	0.5409	0.03	Q	.	.	.	V.
20.500	0.5411	0.03	Q	.	.	.	V.
20.583	0.5414	0.03	Q	.	.	.	V.
20.667	0.5416	0.03	Q	.	.	.	V.
20.750	0.5418	0.03	Q	.	.	.	V.
20.833	0.5420	0.03	Q	.	.	.	V.
20.917	0.5423	0.03	Q	.	.	.	V.
21.000	0.5425	0.03	Q	.	.	.	V.
21.083	0.5427	0.03	Q	.	.	.	V.
21.167	0.5429	0.03	Q	.	.	.	V.
21.250	0.5431	0.03	Q	.	.	.	V.
21.333	0.5433	0.03	Q	.	.	.	V.
21.417	0.5435	0.03	Q	.	.	.	V.
21.500	0.5437	0.03	Q	.	.	.	V.
21.583	0.5440	0.03	Q	.	.	.	V.
21.667	0.5442	0.03	Q	.	.	.	V.
21.750	0.5444	0.03	Q	.	.	.	V.
21.833	0.5445	0.03	Q	.	.	.	V.
21.917	0.5447	0.03	Q	.	.	.	V.
22.000	0.5449	0.03	Q	.	.	.	V.
22.083	0.5451	0.03	Q	.	.	.	V.
22.167	0.5453	0.03	Q	.	.	.	V.
22.250	0.5455	0.03	Q	.	.	.	V.
22.333	0.5457	0.03	Q	.	.	.	V.
22.417	0.5459	0.03	Q	.	.	.	V.
22.500	0.5461	0.03	Q	.	.	.	V.
22.583	0.5462	0.03	Q	.	.	.	V.
22.667	0.5464	0.03	Q	.	.	.	V.
22.750	0.5466	0.03	Q	.	.	.	V.

22.833	0.5468	0.03	Q	.	.	.	V.
22.917	0.5470	0.03	Q	.	.	.	V.
23.000	0.5471	0.03	Q	.	.	.	V.
23.083	0.5473	0.03	Q	.	.	.	V.
23.167	0.5475	0.02	Q	.	.	.	V.
23.250	0.5476	0.02	Q	.	.	.	V.
23.333	0.5478	0.02	Q	.	.	.	V.
23.417	0.5480	0.02	Q	.	.	.	V.
23.500	0.5482	0.02	Q	.	.	.	V.
23.583	0.5483	0.02	Q	.	.	.	V.
23.667	0.5485	0.02	Q	.	.	.	V.
23.750	0.5486	0.02	Q	.	.	.	V.
23.833	0.5488	0.02	Q	.	.	.	V.
23.917	0.5490	0.02	Q	.	.	.	V.
24.000	0.5491	0.02	Q	.	.	.	V.
24.083	0.5493	0.02	Q	.	.	.	V.
24.167	0.5494	0.02	Q	.	.	.	V.
24.250	0.5495	0.01	Q	.	.	.	V.
24.333	0.5495	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1460.0
10%	45.0
20%	35.0
30%	30.0
40%	20.0
50%	20.0
60%	20.0
70%	15.0
80%	10.0
90%	10.0

END OF FLOODSCx ROUTING ANALYSIS

2-YR STUDY

HYDROLOGY CALCULATIONS

PROPOSED CONDITION

WEST - AREAS ‘A’, ‘B’ & ‘C’

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******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                       Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* W.O. #4213-3, BREA CENTRAL                                             *
* 2-YR STUDY                                                             *
* PROPOSED - WEST AREA - DRAINAGE AREA 'A'                               *
 ************************************************************************

  FILE NAME: WEST-A.DAT
  TIME/DATE OF STUDY: 10:40 01/12/2022
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  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) I 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   20.0     15.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    522.00  DOWNSTREAM(FEET) =    519.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.646
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.774
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        1.40      0.20     0.200    57    7.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.18
  TOTAL AREA(ACRES) =      1.40   PEAK FLOW RATE(CFS) =      2.18

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

```
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   519.00  DOWNSTREAM(FEET) =   515.00
  FLOW LENGTH(FEET) =   410.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.48
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.18
  PIPE TRAVEL TIME(MIN.) =   1.53    Tc(MIN.) =    9.17
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.17
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.598
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        4.35      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    4.35      SUBAREA RUNOFF(CFS) =    6.10
  EFFECTIVE AREA(ACRES) =      5.75   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.8       PEAK FLOW RATE(CFS) =       8.06

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   515.00  DOWNSTREAM(FEET) =   507.50
  FLOW LENGTH(FEET) =   410.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.97
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.06
  PIPE TRAVEL TIME(MIN.) =   0.86    Tc(MIN.) =   10.03
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1100.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.03
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.518
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        4.56      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    4.56      SUBAREA RUNOFF(CFS) =    6.07
  EFFECTIVE AREA(ACRES) =     10.31   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       10.3       PEAK FLOW RATE(CFS) =      13.72

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      7.00 IS CODE =  31
```

```
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   507.50  DOWNSTREAM(FEET) =   502.50
  FLOW LENGTH(FEET) =   420.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.63
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.72
  PIPE TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =   10.95
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.95
  RAINFALL INTENSITY(INCH/HR) =   1.44
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      10.31
  TOTAL STREAM AREA(ACRES) =      10.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.72

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    507.50  DOWNSTREAM(FEET) =    504.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.082
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.854
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.26      0.20     0.100    57    7.08
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.26   PEAK FLOW RATE(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  62
--------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  504.30  DOWNSTREAM ELEVATION(FEET) =  502.50
  STREET LENGTH(FEET) =   155.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.56
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.71
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.37
  STREET FLOW TRAVEL TIME(MIN.) =   1.51   Tc(MIN.) =    8.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.659
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.18      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.27
  EFFECTIVE AREA(ACRES) =      0.44    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       0.65

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   5.26
  FLOW VELOCITY(FEET/SEC.) =  1.76   DEPTH*VELOCITY(FT*FT/SEC.) =   0.39
  LONGEST FLOWPATH FROM NODE      5.00 TO NODE      7.00 =     435.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.659
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.40      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.40      SUBAREA RUNOFF(CFS) =    0.59
  EFFECTIVE AREA(ACRES) =      0.84   AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       1.24

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.60
  RAINFALL INTENSITY(INCH/HR) =   1.66
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.84
  TOTAL STREAM AREA(ACRES) =       0.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.24

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       13.72   10.95    1.444  0.20( 0.04) 0.20      10.3       1.00
      2        1.24    8.60    1.659  0.20( 0.02) 0.10       0.8       5.00

  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       13.66    8.60    1.659  0.20( 0.04) 0.19       8.9       5.00
      2       14.79   10.95    1.444  0.20( 0.04) 0.19      11.1       1.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.79    Tc(MIN.) =    10.95
  EFFECTIVE AREA(ACRES) =      11.15   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       11.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE     10.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   502.50  DOWNSTREAM(FEET) =   502.00
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.10
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.79
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   11.08
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     10.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.08
  RAINFALL INTENSITY(INCH/HR) =   1.43
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =      11.15
  TOTAL STREAM AREA(ACRES) =      11.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      14.79

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    525.00  DOWNSTREAM(FEET) =    518.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.311
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.980
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.71      0.20     0.100    57    6.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.25
  TOTAL AREA(ACRES) =      0.71   PEAK FLOW RATE(CFS) =      1.25

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  518.00  DOWNSTREAM ELEVATION(FEET) =  502.00
  STREET LENGTH(FEET) =   770.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
```

```
 INSIDE STREET CROSSFALL(DECIMAL) =  0.017
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.32
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.31
   HALFSTREET FLOOD WIDTH(FEET) =    8.47
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.88
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.89
 STREET FLOW TRAVEL TIME(MIN.) =   4.45   Tc(MIN.) =   10.77
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.458
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        1.64      0.20     0.100    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.64      SUBAREA RUNOFF(CFS) =    2.12
 EFFECTIVE AREA(ACRES) =      2.35    AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       3.04

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.70
 FLOW VELOCITY(FEET/SEC.) =  3.05   DEPTH*VELOCITY(FT*FT/SEC.) =   1.01
 LONGEST FLOWPATH FROM NODE      8.00 TO NODE     10.00 =    1070.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =   10.77
 RAINFALL INTENSITY(INCH/HR) =   1.46
 AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.35
 TOTAL STREAM AREA(ACRES) =       2.35
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.04

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.66    8.73    1.644  0.20( 0.04) 0.19       8.9       5.00
     1       14.79   11.08    1.434  0.20( 0.04) 0.19      11.1       1.00
     2        3.04   10.77    1.458  0.20( 0.02) 0.10       2.3       8.00

 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       16.44    8.73    1.644  0.20( 0.03) 0.17      10.8       5.00
     2       17.68   10.77    1.458  0.20( 0.04) 0.18      13.2       8.00
     3       17.78   11.08    1.434  0.20( 0.04) 0.18      13.5       1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.78    Tc(MIN.) =    11.08
 EFFECTIVE AREA(ACRES) =      13.50   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =       13.5
```

```
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     10.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   502.00  DOWNSTREAM(FEET) =   501.50
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.61
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.78
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   11.27
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     13.00 =    1650.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.27
  RAINFALL INTENSITY(INCH/HR) =   1.42
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =      13.50
  TOTAL STREAM AREA(ACRES) =      13.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.78

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    521.00  DOWNSTREAM(FEET) =    517.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.059
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.857
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.65      0.20      0.100    57    7.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.07
  TOTAL AREA(ACRES) =      0.65   PEAK FLOW RATE(CFS) =      1.07

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  517.00  DOWNSTREAM ELEVATION(FEET) =  501.50
  STREET LENGTH(FEET) =   735.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

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

```
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    7.77
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.83
  STREET FLOW TRAVEL TIME(MIN.) =   4.35   Tc(MIN.) =   11.41
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.410
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        1.46      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.46      SUBAREA RUNOFF(CFS) =    1.83
  EFFECTIVE AREA(ACRES) =      2.11    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =       2.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.00
  FLOW VELOCITY(FEET/SEC.) =  2.99   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     13.00 =    1035.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 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.) =   11.41
  RAINFALL INTENSITY(INCH/HR) =   1.41
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.11
  TOTAL STREAM AREA(ACRES) =       2.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.64

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       16.44    8.93    1.623  0.20( 0.03) 0.17      10.8       5.00
      1       17.68   10.96    1.443  0.20( 0.04) 0.18      13.2       8.00
      1       17.78   11.27    1.420  0.20( 0.04) 0.18      13.5       1.00
      2        2.64   11.41    1.410  0.20( 0.02) 0.10       2.1      11.00

  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       18.83    8.93    1.623  0.20( 0.03) 0.16      12.5       5.00
      2       20.28   10.96    1.443  0.20( 0.03) 0.17      15.2       8.00
      3       20.41   11.27    1.420  0.20( 0.03) 0.17      15.6       1.00
      4       20.29   11.41    1.410  0.20( 0.03) 0.17      15.6      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.41    Tc(MIN.) =    11.27
  EFFECTIVE AREA(ACRES) =      15.58   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =       15.6
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     13.00 =    1650.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     16.00 IS CODE =  31
```

```
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   501.50  DOWNSTREAM(FEET) =   480.00
  FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.09
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.41
  PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =   12.23
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     16.00 =    2350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.23
  RAINFALL INTENSITY(INCH/HR) =   1.35
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.17
  EFFECTIVE STREAM AREA(ACRES) =      15.58
  TOTAL STREAM AREA(ACRES) =      15.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.41

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    505.00  DOWNSTREAM(FEET) =    490.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.419
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.161
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.31      0.20     0.100    57    5.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.60
  TOTAL AREA(ACRES) =      0.31   PEAK FLOW RATE(CFS) =      0.60

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  490.00  DOWNSTREAM ELEVATION(FEET) =  480.00
  STREET LENGTH(FEET) =   295.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.94
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    4.73
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.63
  STREET FLOW TRAVEL TIME(MIN.) =   1.68   Tc(MIN.) =    7.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.851
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.41      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.68
  EFFECTIVE AREA(ACRES) =      0.72    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       1.19

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.50
  FLOW VELOCITY(FEET/SEC.) =  3.04   DEPTH*VELOCITY(FT*FT/SEC.) =   0.69
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     16.00 =     595.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.851
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.41      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.68
  EFFECTIVE AREA(ACRES) =      1.13   AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       1.86

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.10
  RAINFALL INTENSITY(INCH/HR) =   1.85
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.13
  TOTAL STREAM AREA(ACRES) =       1.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.86

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       18.83    9.91    1.529  0.20( 0.03) 0.16      12.5       5.00
      1       20.28   11.92    1.375  0.20( 0.03) 0.17      15.2       8.00
      1       20.41   12.23    1.355  0.20( 0.03) 0.17      15.6       1.00
      1       20.29   12.37    1.346  0.20( 0.03) 0.17      15.6      11.00
      2        1.86    7.10    1.851  0.20( 0.02) 0.10       1.1      14.00

  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       18.26    7.10    1.851  0.20( 0.03) 0.16      10.1      14.00
      2       20.36    9.91    1.529  0.20( 0.03) 0.16      13.6       5.00
      3       21.65   11.92    1.375  0.20( 0.03) 0.16      16.4       8.00
      4       21.76   12.23    1.355  0.20( 0.03) 0.16      16.7       1.00
      5       21.64   12.37    1.346  0.20( 0.03) 0.16      16.7      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.76    Tc(MIN.) =    12.23
  EFFECTIVE AREA(ACRES) =      16.71   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.16
  TOTAL AREA(ACRES) =       16.7
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     16.00 =    2350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     18.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   480.00  DOWNSTREAM(FEET) =   479.70
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.13
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.76
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =   12.55
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     18.00 =    2450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.55
  RAINFALL INTENSITY(INCH/HR) =   1.33
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =      16.71
  TOTAL STREAM AREA(ACRES) =      16.74
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.76

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     18.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    484.00  DOWNSTREAM(FEET) =    479.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.957
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.873
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  D        0.33      0.20      0.100    57    6.96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.33   PEAK FLOW RATE(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
  MAINLINE Tc(MIN.) =    6.96
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.873
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.29      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.29      SUBAREA RUNOFF(CFS) =    0.48
  EFFECTIVE AREA(ACRES) =      0.62   AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.6       PEAK FLOW RATE(CFS) =       1.03

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.96
  RAINFALL INTENSITY(INCH/HR) =   1.87
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.62
  TOTAL STREAM AREA(ACRES) =       0.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.03

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       18.26    7.44    1.802  0.20( 0.03) 0.16      10.1      14.00
      1       20.36   10.25    1.500  0.20( 0.03) 0.16      13.6       5.00
      1       21.65   12.25    1.354  0.20( 0.03) 0.16      16.4       8.00
      1       21.76   12.55    1.334  0.20( 0.03) 0.16      16.7       1.00
      1       21.64   12.70    1.326  0.20( 0.03) 0.16      16.7      11.00
      2        1.03    6.96    1.873  0.20( 0.02) 0.10       0.6      17.00

  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       18.79    6.96    1.873  0.20( 0.03) 0.15      10.0      17.00
      2       19.25    7.44    1.802  0.20( 0.03) 0.15      10.7      14.00
      3       21.18   10.25    1.500  0.20( 0.03) 0.16      14.2       5.00
      4       22.40   12.25    1.354  0.20( 0.03) 0.16      17.0       8.00
      5       22.50   12.55    1.334  0.20( 0.03) 0.16      17.3       1.00
      6       22.37   12.70    1.326  0.20( 0.03) 0.16      17.4      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.50    Tc(MIN.) =    12.55
  EFFECTIVE AREA(ACRES) =      17.33   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.16
  TOTAL AREA(ACRES) =       17.4
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     18.00 =    2450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.70  DOWNSTREAM(FEET) =   479.60
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  21.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      22.50
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   12.65
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     21.00 =    2480.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.65
  RAINFALL INTENSITY(INCH/HR) =   1.33
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =      17.33
  TOTAL STREAM AREA(ACRES) =      17.36
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      22.50

****************************************************************************
  FLOW PROCESS FROM NODE     19.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    495.50  DOWNSTREAM(FEET) =    491.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.348
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.815
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        1.57      0.20     0.200    57    7.35
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.51
  TOTAL AREA(ACRES) =      1.57   PEAK FLOW RATE(CFS) =      2.51

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.00  DOWNSTREAM(FEET) =   483.00
  FLOW LENGTH(FEET) =   370.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.20
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.51
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =    8.34
  LONGEST FLOWPATH FROM NODE     19.00 TO NODE     21.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.34
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.687
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        3.74      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    3.74      SUBAREA RUNOFF(CFS) =    5.54
  EFFECTIVE AREA(ACRES) =      5.31   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =       7.87

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.34
  RAINFALL INTENSITY(INCH/HR) =   1.69
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       5.31
  TOTAL STREAM AREA(ACRES) =       5.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.87

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       18.79    7.06    1.858  0.20( 0.03) 0.15      10.0      17.00
      1       19.25    7.54    1.788  0.20( 0.03) 0.15      10.7      14.00
      1       21.18   10.34    1.492  0.20( 0.03) 0.16      14.2       5.00
      1       22.40   12.34    1.348  0.20( 0.03) 0.16      17.0       8.00
      1       22.50   12.65    1.329  0.20( 0.03) 0.16      17.3       1.00
      1       22.37   12.79    1.320  0.20( 0.03) 0.16      17.4      11.00
      2        7.87    8.34    1.687  0.20( 0.04) 0.20       5.3      19.00

  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       26.13    7.06    1.858  0.20( 0.03) 0.17      14.5      17.00
      2       26.80    7.54    1.788  0.20( 0.03) 0.17      15.5      14.00
      3       27.68    8.34    1.687  0.20( 0.03) 0.17      17.0      19.00
      4       28.12   10.34    1.492  0.20( 0.03) 0.17      19.6       5.00
      5       28.65   12.34    1.348  0.20( 0.03) 0.17      22.3       8.00
      6       28.66   12.65    1.329  0.20( 0.03) 0.17      22.6       1.00
      7       28.48   12.79    1.320  0.20( 0.03) 0.17      22.7      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      28.66    Tc(MIN.) =    12.65
  EFFECTIVE AREA(ACRES) =      22.64   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =       22.7
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     21.00 =    2480.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.60  DOWNSTREAM(FEET) =   478.70
  FLOW LENGTH(FEET) =   425.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  29.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.69
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.66
  PIPE TRAVEL TIME(MIN.) =   1.51    Tc(MIN.) =   14.16
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     23.00 =    2905.00 FEET.

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

```
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.16
  RAINFALL INTENSITY(INCH/HR) =   1.25
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.17
  EFFECTIVE STREAM AREA(ACRES) =      22.64
  TOTAL STREAM AREA(ACRES) =      22.67
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.66

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    482.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.700
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.914
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.28      0.20      0.100    57    6.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.48
  TOTAL AREA(ACRES) =      0.28   PEAK FLOW RATE(CFS) =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.70
  RAINFALL INTENSITY(INCH/HR) =   1.91
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.28
  TOTAL STREAM AREA(ACRES) =       0.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.48

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     23.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =    484.00  DOWNSTREAM(FEET) =    482.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.357
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.972
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.26      0.20      0.100    57    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.46
```

```
  TOTAL AREA(ACRES) =      0.26   PEAK FLOW RATE(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.36
  RAINFALL INTENSITY(INCH/HR) =   1.97
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.26
  TOTAL STREAM AREA(ACRES) =       0.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.46

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       26.13    8.58    1.661  0.20( 0.03) 0.17      14.5      17.00
      1       26.80    9.06    1.610  0.20( 0.03) 0.17      15.5      14.00
      1       27.68    9.85    1.534  0.20( 0.03) 0.17      17.0      19.00
      1       28.12   11.85    1.379  0.20( 0.03) 0.17      19.6       5.00
      1       28.65   13.85    1.261  0.20( 0.03) 0.17      22.3       8.00
      1       28.66   14.16    1.246  0.20( 0.03) 0.17      22.6       1.00
      1       28.48   14.30    1.238  0.20( 0.03) 0.17      22.7      11.00
      2        0.48    6.70    1.914  0.20( 0.02) 0.10       0.3      22.00
      3        0.46    6.36    1.972  0.20( 0.02) 0.10       0.3      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       24.00    6.36    1.972  0.20( 0.03) 0.17      11.3      40.00
      2       24.51    6.70    1.914  0.20( 0.03) 0.17      11.9      22.00
      3       26.93    8.58    1.661  0.20( 0.03) 0.17      15.1      17.00
      4       27.58    9.06    1.610  0.20( 0.03) 0.17      16.0      14.00
      5       28.41    9.85    1.534  0.20( 0.03) 0.17      17.6      19.00
      6       28.78   11.85    1.379  0.20( 0.03) 0.17      20.1       5.00
      7       29.25   13.85    1.261  0.20( 0.03) 0.17      22.8       8.00
      8       29.25   14.16    1.246  0.20( 0.03) 0.17      23.2       1.00
      9       29.08   14.30    1.238  0.20( 0.03) 0.17      23.2      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      29.25    Tc(MIN.) =    14.16
  EFFECTIVE AREA(ACRES) =      23.18   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =       23.2
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     23.00 =    2905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     28.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.70  DOWNSTREAM(FEET) =   478.50
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.80
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      29.25
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =   14.31
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     28.00 =    2960.00 FEET.

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

```
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 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.) =   14.31
  RAINFALL INTENSITY(INCH/HR) =   1.24
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.17
  EFFECTIVE STREAM AREA(ACRES) =      23.18
  TOTAL STREAM AREA(ACRES) =      23.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      29.25

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     25.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  ELEVATION DATA: UPSTREAM(FEET) =    520.00  DOWNSTREAM(FEET) =    500.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.32      0.20      0.100    57    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   500.00  DOWNSTREAM(FEET) =   493.00
  FLOW LENGTH(FEET) =   225.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.65
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =    5.79
  LONGEST FLOWPATH FROM NODE     24.00 TO NODE     26.00 =     475.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.79
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.080
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.27      0.20      0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.27      SUBAREA RUNOFF(CFS) =    0.50
  EFFECTIVE AREA(ACRES) =      0.59   AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.6       PEAK FLOW RATE(CFS) =       1.09

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

```
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   493.00  DOWNSTREAM(FEET) =   484.50
 FLOW LENGTH(FEET) =   890.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.65
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.09
 PIPE TRAVEL TIME(MIN.) =   4.06    Tc(MIN.) =    9.85
 LONGEST FLOWPATH FROM NODE     24.00 TO NODE     27.00 =    1365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.85
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.534
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       D        7.43      0.20     0.200    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    7.43      SUBAREA RUNOFF(CFS) =    9.99
 EFFECTIVE AREA(ACRES) =      8.02   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =      10.79

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   484.50  DOWNSTREAM(FEET) =   478.50
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  22.19
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.79
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    9.87
 LONGEST FLOWPATH FROM NODE     24.00 TO NODE     28.00 =    1390.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.87
 RAINFALL INTENSITY(INCH/HR) =   1.53
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.19
 EFFECTIVE STREAM AREA(ACRES) =       8.02
 TOTAL STREAM AREA(ACRES) =       8.02
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.79

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       24.00    6.52    1.944  0.20( 0.03) 0.17      11.3      40.00
```

```
     1       24.51    6.86    1.888  0.20( 0.03) 0.17      11.9      22.00
     1       26.93    8.73    1.643  0.20( 0.03) 0.17      15.1      17.00
     1       27.58    9.21    1.594  0.20( 0.03) 0.17      16.0      14.00
     1       28.41   10.01    1.520  0.20( 0.03) 0.17      17.6      19.00
     1       28.78   12.01    1.369  0.20( 0.03) 0.17      20.1       5.00
     1       29.25   14.01    1.253  0.20( 0.03) 0.17      22.8       8.00
     1       29.25   14.31    1.238  0.20( 0.03) 0.17      23.2       1.00
     1       29.08   14.46    1.230  0.20( 0.03) 0.17      23.2      11.00
     2       10.79    9.87    1.532  0.20( 0.04) 0.19       8.0      24.00

  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       33.10    6.52    1.944  0.20( 0.03) 0.17      16.6      40.00
      2       33.80    6.86    1.888  0.20( 0.03) 0.17      17.5      22.00
      3       37.19    8.73    1.643  0.20( 0.03) 0.17      22.2      17.00
      4       38.07    9.21    1.594  0.20( 0.03) 0.17      23.5      14.00
      5       39.06    9.87    1.532  0.20( 0.03) 0.17      25.3      24.00
      6       39.12   10.01    1.520  0.20( 0.03) 0.17      25.6      19.00
      7       38.40   12.01    1.369  0.20( 0.03) 0.17      28.1       5.00
      8       38.03   14.01    1.253  0.20( 0.03) 0.17      30.9       8.00
      9       37.92   14.31    1.238  0.20( 0.03) 0.17      31.2       1.00
     10       37.69   14.46    1.230  0.20( 0.03) 0.17      31.2      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      39.12    Tc(MIN.) =    10.01
  EFFECTIVE AREA(ACRES) =      25.59   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
  TOTAL AREA(ACRES) =       31.2
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     28.00 =    2960.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.50  DOWNSTREAM(FEET) =   478.10
  FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  29.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.33
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      39.12
  PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =   10.56
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     32.00 =    3135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.56
  RAINFALL INTENSITY(INCH/HR) =   1.47
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.17
  EFFECTIVE STREAM AREA(ACRES) =      25.59
  TOTAL STREAM AREA(ACRES) =      31.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      39.12

****************************************************************************
  FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    497.50  DOWNSTREAM(FEET) =    492.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.059
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.857
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        1.47      0.20     0.200    57    7.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.40
  TOTAL AREA(ACRES) =      1.47   PEAK FLOW RATE(CFS) =      2.40

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   492.00  DOWNSTREAM(FEET) =   483.50
  FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.08
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.40
  PIPE TRAVEL TIME(MIN.) =   1.10    Tc(MIN.) =    8.16
  LONGEST FLOWPATH FROM NODE     29.00 TO NODE     31.00 =     700.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.16
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.709
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        3.07      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    3.07      SUBAREA RUNOFF(CFS) =    4.61
  EFFECTIVE AREA(ACRES) =      4.54   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.5       PEAK FLOW RATE(CFS) =       6.82

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   483.50  DOWNSTREAM(FEET) =   478.10
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.25
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.82
  PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =    8.94
  LONGEST FLOWPATH FROM NODE     29.00 TO NODE     32.00 =    1040.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.94
  RAINFALL INTENSITY(INCH/HR) =   1.62
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       4.54
  TOTAL STREAM AREA(ACRES) =       4.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.82

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       33.10    7.09    1.852  0.20( 0.03) 0.17      16.6      40.00
      1       33.80    7.43    1.803  0.20( 0.03) 0.17      17.5      22.00
      1       37.19    9.30    1.585  0.20( 0.03) 0.17      22.2      17.00
      1       38.07    9.76    1.542  0.20( 0.03) 0.17      23.5      14.00
      1       39.06   10.42    1.485  0.20( 0.03) 0.17      25.3      24.00
      1       39.12   10.56    1.474  0.20( 0.03) 0.17      25.6      19.00
      1       38.40   12.56    1.334  0.20( 0.03) 0.17      28.1       5.00
      1       38.03   14.56    1.226  0.20( 0.03) 0.17      30.9       8.00
      1       37.92   14.86    1.211  0.20( 0.03) 0.17      31.2       1.00
      1       37.69   15.01    1.204  0.20( 0.03) 0.17      31.2      11.00
      2        6.82    8.94    1.622  0.20( 0.04) 0.20       4.5      29.00

  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       39.30    7.09    1.852  0.20( 0.04) 0.18      20.2      40.00
      2       40.12    7.43    1.803  0.20( 0.04) 0.18      21.2      22.00
      3       43.35    8.94    1.622  0.20( 0.04) 0.18      25.8      29.00
      4       43.86    9.30    1.585  0.20( 0.04) 0.18      26.7      17.00
      5       44.54    9.76    1.542  0.20( 0.04) 0.18      28.1      14.00
      6       45.29   10.42    1.485  0.20( 0.04) 0.18      29.9      24.00
      7       45.30   10.56    1.474  0.20( 0.04) 0.18      30.1      19.00
      8       43.98   12.56    1.334  0.20( 0.04) 0.18      32.7       5.00
      9       43.14   14.56    1.226  0.20( 0.04) 0.18      35.4       8.00
     10       42.97   14.86    1.211  0.20( 0.04) 0.18      35.7       1.00
     11       42.71   15.01    1.204  0.20( 0.04) 0.18      35.8      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      45.30    Tc(MIN.) =    10.56
  EFFECTIVE AREA(ACRES) =      30.13   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =       35.8
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     32.00 =    3135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.10  DOWNSTREAM(FEET) =   478.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  32.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.64
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.30
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   10.68
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     33.00 =    3175.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   478.00  DOWNSTREAM(FEET) =   470.50
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  23.98
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.30
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   10.72
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     36.00 =    3240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.72
  RAINFALL INTENSITY(INCH/HR) =   1.46
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =      30.13
  TOTAL STREAM AREA(ACRES) =      35.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      45.30

****************************************************************************
  FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  USER SPECIFIED Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  ".4 DWELLING/ACRE"          D        0.81      0.20     0.900    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      1.52
  TOTAL AREA(ACRES) =      0.81   PEAK FLOW RATE(CFS) =      1.52

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   471.00  DOWNSTREAM(FEET) =   470.50
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.18
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.52
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =    5.52
  LONGEST FLOWPATH FROM NODE     34.00 TO NODE     36.00 =     165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
```

```
  TIME OF CONCENTRATION(MIN.) =    5.52
  RAINFALL INTENSITY(INCH/HR) =   2.14
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.90
  EFFECTIVE STREAM AREA(ACRES) =       0.81
  TOTAL STREAM AREA(ACRES) =       0.81
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.52

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       39.30    7.26    1.828  0.20( 0.04) 0.18      20.2      40.00
      1       40.12    7.60    1.780  0.20( 0.04) 0.18      21.2      22.00
      1       43.35    9.10    1.605  0.20( 0.04) 0.18      25.8      29.00
      1       43.86    9.46    1.569  0.20( 0.04) 0.18      26.7      17.00
      1       44.54    9.93    1.527  0.20( 0.04) 0.18      28.1      14.00
      1       45.29   10.58    1.472  0.20( 0.04) 0.18      29.9      24.00
      1       45.30   10.72    1.461  0.20( 0.04) 0.18      30.1      19.00
      1       43.98   12.72    1.324  0.20( 0.04) 0.18      32.7       5.00
      1       43.14   14.72    1.218  0.20( 0.04) 0.18      35.4       8.00
      1       42.97   15.03    1.204  0.20( 0.04) 0.18      35.7       1.00
      1       42.71   15.18    1.197  0.20( 0.04) 0.18      35.8      11.00
      2        1.52    5.52    2.138  0.20( 0.18) 0.90       0.8      34.00

  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       36.60    5.52    2.138  0.20( 0.04) 0.21      16.2      34.00
      2       40.58    7.26    1.828  0.20( 0.04) 0.21      21.0      40.00
      3       41.36    7.60    1.780  0.20( 0.04) 0.21      22.1      22.00
      4       44.46    9.10    1.605  0.20( 0.04) 0.20      26.6      29.00
      5       44.94    9.46    1.569  0.20( 0.04) 0.20      27.5      17.00
      6       45.59    9.93    1.527  0.20( 0.04) 0.20      28.9      14.00
      7       46.29   10.58    1.472  0.20( 0.04) 0.20      30.7      24.00
      8       46.29   10.72    1.461  0.20( 0.04) 0.20      30.9      19.00
      9       44.86   12.72    1.324  0.20( 0.04) 0.20      33.5       5.00
     10       43.95   14.72    1.218  0.20( 0.04) 0.19      36.2       8.00
     11       43.76   15.03    1.204  0.20( 0.04) 0.19      36.6       1.00
     12       43.50   15.18    1.197  0.20( 0.04) 0.19      36.6      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      46.29    Tc(MIN.) =    10.72
  EFFECTIVE AREA(ACRES) =      30.94   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       36.6
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     36.00 =    3240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     39.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   470.50  DOWNSTREAM(FEET) =   470.40
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  27.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.47
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      46.29
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   10.77
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     39.00 =    3260.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     39.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
```

```
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.77
  RAINFALL INTENSITY(INCH/HR) =   1.46
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      30.94
  TOTAL STREAM AREA(ACRES) =      36.58
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      46.29

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     38.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    487.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.523
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.790
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        2.06      0.20     0.200    57    7.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.25
  TOTAL AREA(ACRES) =      2.06   PEAK FLOW RATE(CFS) =      3.25

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     39.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   487.00  DOWNSTREAM(FEET) =   470.40
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.92
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.25
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    7.73
  LONGEST FLOWPATH FROM NODE     37.00 TO NODE     39.00 =     450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     39.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.73
  RAINFALL INTENSITY(INCH/HR) =   1.76
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       2.06
  TOTAL STREAM AREA(ACRES) =       2.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.25

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       36.60    5.57    2.128  0.20( 0.04) 0.21      16.2      34.00
      1       40.58    7.31    1.821  0.20( 0.04) 0.21      21.0      40.00
```

```
     1       41.36    7.64    1.774  0.20( 0.04) 0.21      22.1      22.00
     1       44.46    9.15    1.600  0.20( 0.04) 0.20      26.6      29.00
     1       44.94    9.51    1.565  0.20( 0.04) 0.20      27.5      17.00
     1       45.59    9.97    1.523  0.20( 0.04) 0.20      28.9      14.00
     1       46.29   10.63    1.469  0.20( 0.04) 0.20      30.7      24.00
     1       46.29   10.77    1.458  0.20( 0.04) 0.20      30.9      19.00
     1       44.86   12.77    1.322  0.20( 0.04) 0.20      33.5       5.00
     1       43.95   14.77    1.216  0.20( 0.04) 0.19      36.2       8.00
     1       43.76   15.07    1.201  0.20( 0.04) 0.19      36.6       1.00
     1       43.50   15.22    1.195  0.20( 0.04) 0.19      36.6      11.00
     2        3.25    7.73    1.762  0.20( 0.04) 0.20       2.1      37.00

  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       39.44    5.57    2.128  0.20( 0.04) 0.21      17.7      34.00
      2       43.75    7.31    1.821  0.20( 0.04) 0.21      23.0      40.00
      3       44.59    7.64    1.774  0.20( 0.04) 0.20      24.1      22.00
      4       44.79    7.73    1.762  0.20( 0.04) 0.20      24.4      37.00
      5       47.40    9.15    1.600  0.20( 0.04) 0.20      28.7      29.00
      6       47.81    9.51    1.565  0.20( 0.04) 0.20      29.6      17.00
      7       48.38    9.97    1.523  0.20( 0.04) 0.20      30.9      14.00
      8       48.98   10.63    1.469  0.20( 0.04) 0.20      32.7      24.00
      9       48.96   10.77    1.458  0.20( 0.04) 0.20      33.0      19.00
     10       47.28   12.77    1.322  0.20( 0.04) 0.20      35.5       5.00
     11       46.16   14.77    1.216  0.20( 0.04) 0.19      38.3       8.00
     12       45.95   15.07    1.201  0.20( 0.04) 0.19      38.6       1.00
     13       45.67   15.22    1.195  0.20( 0.04) 0.19      38.6      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      48.98    Tc(MIN.) =    10.63
  EFFECTIVE AREA(ACRES) =      32.73   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       38.6
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     39.00 =    3260.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     41.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   470.40  DOWNSTREAM(FEET) =   469.80
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  33.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.64
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      48.98
  PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =   11.39
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     41.00 =    3520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.39
  RAINFALL INTENSITY(INCH/HR) =   1.41
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      32.73
  TOTAL STREAM AREA(ACRES) =      38.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      48.98

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

```
 FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
 ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    479.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.059
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.857
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 D        0.26      0.20     0.100    57    7.06
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.43
 TOTAL AREA(ACRES) =      0.26   PEAK FLOW RATE(CFS) =      0.43

****************************************************************************
 FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.06
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.857
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.55      0.20     0.100    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.55      SUBAREA RUNOFF(CFS) =    0.91
 EFFECTIVE AREA(ACRES) =      0.81   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       1.34

****************************************************************************
 FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.06
 RAINFALL INTENSITY(INCH/HR) =   1.86
 AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.81
 TOTAL STREAM AREA(ACRES) =       0.81
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.34

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       39.44    6.38    1.968  0.20( 0.04) 0.21      17.7      34.00
     1       43.75    8.10    1.716  0.20( 0.04) 0.21      23.0      40.00
     1       44.59    8.44    1.676  0.20( 0.04) 0.20      24.1      22.00
     1       44.79    8.53    1.666  0.20( 0.04) 0.20      24.4      37.00
     1       47.40    9.92    1.528  0.20( 0.04) 0.20      28.7      29.00
     1       47.81   10.28    1.497  0.20( 0.04) 0.20      29.6      17.00
     1       48.38   10.74    1.459  0.20( 0.04) 0.20      30.9      14.00
     1       48.98   11.39    1.411  0.20( 0.04) 0.20      32.7      24.00
     1       48.96   11.54    1.401  0.20( 0.04) 0.20      33.0      19.00
     1       47.28   13.54    1.278  0.20( 0.04) 0.20      35.5       5.00
     1       46.16   15.54    1.181  0.20( 0.04) 0.19      38.3       8.00
     1       45.95   15.85    1.167  0.20( 0.04) 0.19      38.6       1.00
     1       45.67   16.02    1.160  0.20( 0.04) 0.19      38.6      11.00
```

```
     2        1.34    7.06    1.857  0.20( 0.02) 0.10       0.8      40.00

  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       40.72    6.38    1.968  0.20( 0.04) 0.21      18.4      34.00
      2       42.47    7.06    1.857  0.20( 0.04) 0.21      20.6      40.00
      3       44.98    8.10    1.716  0.20( 0.04) 0.20      23.8      40.00
      4       45.80    8.44    1.676  0.20( 0.04) 0.20      24.9      22.00
      5       45.99    8.53    1.666  0.20( 0.04) 0.20      25.2      37.00
      6       48.50    9.92    1.528  0.20( 0.04) 0.20      29.5      29.00
      7       48.89   10.28    1.497  0.20( 0.04) 0.20      30.4      17.00
      8       49.43   10.74    1.459  0.20( 0.04) 0.20      31.8      14.00
      9       50.00   11.39    1.411  0.20( 0.04) 0.20      33.5      24.00
     10       49.97   11.54    1.401  0.20( 0.04) 0.20      33.8      19.00
     11       48.20   13.54    1.278  0.20( 0.04) 0.19      36.3       5.00
     12       47.01   15.54    1.181  0.20( 0.04) 0.19      39.1       8.00
     13       46.79   15.85    1.167  0.20( 0.04) 0.19      39.4       1.00
     14       46.51   16.02    1.160  0.20( 0.04) 0.19      39.5      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      50.00    Tc(MIN.) =    11.39
  EFFECTIVE AREA(ACRES) =      33.54   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       39.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     41.00 =    3520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     43.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   469.80  DOWNSTREAM(FEET) =   469.70
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  31.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.49
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      50.00
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   11.47
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     43.00 =    3550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     43.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.47
  RAINFALL INTENSITY(INCH/HR) =   1.41
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      33.54
  TOTAL STREAM AREA(ACRES) =      39.45
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      50.00

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    483.70  DOWNSTREAM(FEET) =    479.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.835
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.892
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 D        0.43      0.20     0.100    57    6.83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.72
 TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.72

****************************************************************************
 FLOW PROCESS FROM NODE     43.00 TO NODE     43.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.83
 RAINFALL INTENSITY(INCH/HR) =   1.89
 AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.43
 TOTAL STREAM AREA(ACRES) =       0.43
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.72

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       40.72    6.46    1.954  0.20( 0.04) 0.21      18.4      34.00
     1       42.47    7.14    1.845  0.20( 0.04) 0.21      20.6      40.00
     1       44.98    8.18    1.706  0.20( 0.04) 0.20      23.8      40.00
     1       45.80    8.52    1.667  0.20( 0.04) 0.20      24.9      22.00
     1       45.99    8.61    1.657  0.20( 0.04) 0.20      25.2      37.00
     1       48.50   10.00    1.521  0.20( 0.04) 0.20      29.5      29.00
     1       48.89   10.36    1.490  0.20( 0.04) 0.20      30.4      17.00
     1       49.43   10.82    1.453  0.20( 0.04) 0.20      31.8      14.00
     1       50.00   11.47    1.405  0.20( 0.04) 0.20      33.5      24.00
     1       49.97   11.61    1.396  0.20( 0.04) 0.20      33.8      19.00
     1       48.20   13.62    1.274  0.20( 0.04) 0.19      36.3       5.00
     1       47.01   15.62    1.177  0.20( 0.04) 0.19      39.1       8.00
     1       46.79   15.93    1.164  0.20( 0.04) 0.19      39.4       1.00
     1       46.51   16.10    1.157  0.20( 0.04) 0.19      39.5      11.00
     2        0.72    6.83    1.892  0.20( 0.02) 0.10       0.4      42.00

 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       41.43    6.46    1.954  0.20( 0.04) 0.21      18.8      34.00
     2       42.41    6.83    1.892  0.20( 0.04) 0.21      20.0      42.00
     3       43.18    7.14    1.845  0.20( 0.04) 0.20      21.0      40.00
     4       45.64    8.18    1.706  0.20( 0.04) 0.20      24.2      40.00
     5       46.44    8.52    1.667  0.20( 0.04) 0.20      25.3      22.00
     6       46.62    8.61    1.657  0.20( 0.04) 0.20      25.6      37.00
     7       49.08   10.00    1.521  0.20( 0.04) 0.20      29.9      29.00
     8       49.45   10.36    1.490  0.20( 0.04) 0.20      30.8      17.00
     9       49.99   10.82    1.453  0.20( 0.04) 0.20      32.2      14.00
    10       50.53   11.47    1.405  0.20( 0.04) 0.19      34.0      24.00
    11       50.50   11.61    1.396  0.20( 0.04) 0.19      34.2      19.00
    12       48.68   13.62    1.274  0.20( 0.04) 0.19      36.8       5.00
    13       47.46   15.62    1.177  0.20( 0.04) 0.19      39.5       8.00
    14       47.23   15.93    1.164  0.20( 0.04) 0.19      39.9       1.00
    15       46.95   16.10    1.157  0.20( 0.04) 0.19      39.9      11.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      50.53    Tc(MIN.) =    11.47
```

```
  EFFECTIVE AREA(ACRES) =      33.97   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       39.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     43.00 =    3550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     47.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   469.70  DOWNSTREAM(FEET) =   469.40
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  35.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.47
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      50.53
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   11.90
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     47.00 =    3690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     47.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.90
  RAINFALL INTENSITY(INCH/HR) =   1.38
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =      33.97
  TOTAL STREAM AREA(ACRES) =      39.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      50.53

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    483.70  DOWNSTREAM(FEET) =    480.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.731
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.909
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.37      0.20      0.100    57    6.73
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.63
  TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      0.63

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     47.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  480.00  DOWNSTREAM ELEVATION(FEET) =  476.00
  STREET LENGTH(FEET) =   205.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.95
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.67
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.32
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.54
  STREET FLOW TRAVEL TIME(MIN.) =   1.47   Tc(MIN.) =    8.20
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.704
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.42      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    0.64
  EFFECTIVE AREA(ACRES) =      0.79    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       1.20

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   6.49
  FLOW VELOCITY(FEET/SEC.) =  2.41   DEPTH*VELOCITY(FT*FT/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE     44.00 TO NODE     47.00 =     475.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     47.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.20
  RAINFALL INTENSITY(INCH/HR) =   1.70
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.79
  TOTAL STREAM AREA(ACRES) =       0.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.20

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     46.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    484.00  DOWNSTREAM(FEET) =    479.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.751
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.905
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.73      0.20     0.100    57    6.75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.24
  TOTAL AREA(ACRES) =      0.73   PEAK FLOW RATE(CFS) =      1.24

****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     47.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.00  DOWNSTREAM(FEET) =   469.40
  FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.03
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.24
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    6.91
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     47.00 =     385.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     47.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.91
  RAINFALL INTENSITY(INCH/HR) =   1.88
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.73
  TOTAL STREAM AREA(ACRES) =       0.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.24

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       41.43    6.91    1.880  0.20( 0.04) 0.21      18.8      34.00
      1       42.41    7.28    1.824  0.20( 0.04) 0.21      20.0      42.00
      1       43.18    7.59    1.782  0.20( 0.04) 0.20      21.0      40.00
      1       45.64    8.62    1.656  0.20( 0.04) 0.20      24.2      40.00
      1       46.44    8.95    1.621  0.20( 0.04) 0.20      25.3      22.00
      1       46.62    9.04    1.611  0.20( 0.04) 0.20      25.6      37.00
      1       49.08   10.42    1.485  0.20( 0.04) 0.20      29.9      29.00
      1       49.45   10.79    1.456  0.20( 0.04) 0.20      30.8      17.00
      1       49.99   11.25    1.421  0.20( 0.04) 0.20      32.2      14.00
      1       50.53   11.90    1.376  0.20( 0.04) 0.19      34.0      24.00
      1       50.50   12.04    1.367  0.20( 0.04) 0.19      34.2      19.00
      1       48.68   14.05    1.251  0.20( 0.04) 0.19      36.8       5.00
      1       47.46   16.05    1.159  0.20( 0.04) 0.19      39.5       8.00
      1       47.23   16.36    1.146  0.20( 0.04) 0.19      39.9       1.00
      1       46.95   16.53    1.140  0.20( 0.04) 0.19      39.9      11.00
      2        1.20    8.20    1.704  0.20( 0.02) 0.10       0.8      44.00
      3        1.24    6.91    1.880  0.20( 0.02) 0.10       0.7      40.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       43.78    6.91    1.880  0.20( 0.04) 0.20      20.2      34.00
      2       43.78    6.91    1.880  0.20( 0.04) 0.20      20.2      40.00
      3       44.75    7.28    1.824  0.20( 0.04) 0.20      21.5      42.00
      4       45.51    7.59    1.782  0.20( 0.04) 0.20      22.5      40.00
      5       46.97    8.20    1.704  0.20( 0.04) 0.20      24.4      44.00
      6       47.89    8.62    1.656  0.20( 0.04) 0.19      25.7      40.00
      7       48.64    8.95    1.621  0.20( 0.04) 0.19      26.9      22.00
      8       48.82    9.04    1.611  0.20( 0.04) 0.19      27.1      37.00
      9       51.10   10.42    1.485  0.20( 0.04) 0.19      31.4      29.00
     10       51.43   10.79    1.456  0.20( 0.04) 0.19      32.3      17.00
     11       51.92   11.25    1.421  0.20( 0.04) 0.19      33.7      14.00
     12       52.40   11.90    1.376  0.20( 0.04) 0.19      35.5      24.00
     13       52.36   12.04    1.367  0.20( 0.04) 0.19      35.8      19.00
     14       50.38   14.05    1.251  0.20( 0.04) 0.19      38.3       5.00
     15       49.02   16.05    1.159  0.20( 0.04) 0.19      41.0       8.00
     16       48.78   16.36    1.146  0.20( 0.04) 0.19      41.4       1.00
```

```
     17       48.49   16.53    1.140  0.20( 0.04) 0.19      41.4      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      52.40    Tc(MIN.) =    11.90
  EFFECTIVE AREA(ACRES) =      35.49   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       41.4
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     47.00 =    3690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     47.10 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   469.40  DOWNSTREAM(FEET) =   467.00
  FLOW LENGTH(FEET) =   655.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  31.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      52.40
  PIPE TRAVEL TIME(MIN.) =   1.61    Tc(MIN.) =   13.50
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     47.10 =    4345.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.10 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   467.00  DOWNSTREAM(FEET) =   466.00
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  31.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.34
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      52.40
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   13.99
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     62.00 =    4560.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     48.00 TO NODE     49.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    490.00  DOWNSTREAM(FEET) =    486.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.523
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.790
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        1.60      0.20     0.200    57    7.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.52
  TOTAL AREA(ACRES) =      1.60   PEAK FLOW RATE(CFS) =      2.52

****************************************************************************
  FLOW PROCESS FROM NODE     49.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   486.00  DOWNSTREAM(FEET) =   474.00
  FLOW LENGTH(FEET) =   565.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.17
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.52
  PIPE TRAVEL TIME(MIN.) =   1.53    Tc(MIN.) =    9.05
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     50.00 =     865.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.05
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.610
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        9.31      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    9.31      SUBAREA RUNOFF(CFS) =   13.16
  EFFECTIVE AREA(ACRES) =     10.91   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       10.9       PEAK FLOW RATE(CFS) =      15.42

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     54.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   474.00  DOWNSTREAM(FEET) =   473.40
  FLOW LENGTH(FEET) =   300.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.00
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.42
  PIPE TRAVEL TIME(MIN.) =   1.25    Tc(MIN.) =   10.30
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     54.00 =    1165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     54.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.30
  RAINFALL INTENSITY(INCH/HR) =   1.50
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      10.91
  TOTAL STREAM AREA(ACRES) =      10.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.42

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
  ELEVATION DATA: UPSTREAM(FEET) =    480.00  DOWNSTREAM(FEET) =    477.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.292
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.984
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.20      0.20     0.100    57    6.29
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.35
  TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.35

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     53.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  477.00  DOWNSTREAM ELEVATION(FEET) =  475.00
  STREET LENGTH(FEET) =   190.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    4.73
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.63
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.35
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =    8.24
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.699
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.22      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.33
  EFFECTIVE AREA(ACRES) =      0.42    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       0.63

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.38
  FLOW VELOCITY(FEET/SEC.) =  1.67   DEPTH*VELOCITY(FT*FT/SEC.) =   0.38
  LONGEST FLOWPATH FROM NODE     51.00 TO NODE     53.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     53.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.24
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.699
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.46      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.46      SUBAREA RUNOFF(CFS) =    0.70
  EFFECTIVE AREA(ACRES) =      0.88   AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
```

```
  TOTAL AREA(ACRES) =        0.9       PEAK FLOW RATE(CFS) =       1.33

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     54.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   475.00  DOWNSTREAM(FEET) =   473.40
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.26
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.33
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    8.46
  LONGEST FLOWPATH FROM NODE     51.00 TO NODE     54.00 =     485.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     54.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.46
  RAINFALL INTENSITY(INCH/HR) =   1.67
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.88
  TOTAL STREAM AREA(ACRES) =       0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.33

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.42   10.30    1.495  0.20( 0.04) 0.20      10.9      48.00
      2        1.33    8.46    1.674  0.20( 0.02) 0.10       0.9      51.00

  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       15.55    8.46    1.674  0.20( 0.04) 0.19       9.8      51.00
      2       16.61   10.30    1.495  0.20( 0.04) 0.19      11.8      48.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.61    Tc(MIN.) =    10.30
  EFFECTIVE AREA(ACRES) =      11.79   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       11.8
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     54.00 =    1165.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     55.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   473.40  DOWNSTREAM(FEET) =   470.00
  FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.61
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.61
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   10.74
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     55.00 =    1395.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.74
  RAINFALL INTENSITY(INCH/HR) =   1.46
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =      11.79
  TOTAL STREAM AREA(ACRES) =      11.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.61

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     55.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   220.00
  ELEVATION DATA: UPSTREAM(FEET) =    475.00  DOWNSTREAM(FEET) =    470.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.604
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.120
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.17      0.20     0.100    57    5.60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.17   PEAK FLOW RATE(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.60
  RAINFALL INTENSITY(INCH/HR) =   2.12
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.17
  TOTAL STREAM AREA(ACRES) =       0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.32

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       15.55    8.91    1.625  0.20( 0.04) 0.19       9.8      51.00
      1       16.61   10.74    1.459  0.20( 0.04) 0.19      11.8      48.00
      2        0.32    5.60    2.120  0.20( 0.02) 0.10       0.2      53.00

  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       13.16    5.60    2.120  0.20( 0.04) 0.19       6.4      53.00
      2       15.80    8.91    1.625  0.20( 0.04) 0.19      10.0      51.00
      3       16.83   10.74    1.459  0.20( 0.04) 0.19      12.0      48.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.83    Tc(MIN.) =    10.74
  EFFECTIVE AREA(ACRES) =      11.96   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       12.0
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     55.00 =    1395.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     58.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   470.00  DOWNSTREAM(FEET) =   468.00
  FLOW LENGTH(FEET) =   235.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.07
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.83
  PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =   11.30
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     58.00 =    1630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     58.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.30
  RAINFALL INTENSITY(INCH/HR) =   1.42
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =      11.96
  TOTAL STREAM AREA(ACRES) =      11.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.83

****************************************************************************
  FLOW PROCESS FROM NODE     56.00 TO NODE     57.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    476.00  DOWNSTREAM(FEET) =    471.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.751
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.905
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.21      0.20     0.100    57    6.75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.21   PEAK FLOW RATE(CFS) =      0.36

****************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     58.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  471.00  DOWNSTREAM ELEVATION(FEET) =  468.00
  STREET LENGTH(FEET) =   275.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
```

```
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   11.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.32
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.76
  STREET FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    8.72
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.645
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        3.47      0.20     0.200    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    3.47      SUBAREA RUNOFF(CFS) =    5.01
  EFFECTIVE AREA(ACRES) =      3.68    AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =        3.7        PEAK FLOW RATE(CFS) =       5.32

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  14.40
  FLOW VELOCITY(FEET/SEC.) =  2.70   DEPTH*VELOCITY(FT*FT/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     58.00 =     575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     58.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.72
  RAINFALL INTENSITY(INCH/HR) =   1.64
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =       3.68
  TOTAL STREAM AREA(ACRES) =       3.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.32

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       13.16    6.20    2.000  0.20( 0.04) 0.19       6.4      53.00
      1       15.80    9.47    1.569  0.20( 0.04) 0.19      10.0      51.00
      1       16.83   11.30    1.418  0.20( 0.04) 0.19      12.0      48.00
      2        5.32    8.72    1.645  0.20( 0.04) 0.19       3.7      56.00

  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       17.78    6.20    2.000  0.20( 0.04) 0.19       9.0      53.00
      2       20.51    8.72    1.645  0.20( 0.04) 0.19      12.9      56.00
      3       20.87    9.47    1.569  0.20( 0.04) 0.19      13.7      51.00
      4       21.39   11.30    1.418  0.20( 0.04) 0.19      15.6      48.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.39    Tc(MIN.) =    11.30
```

```
  EFFECTIVE AREA(ACRES) =      15.64   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       15.6
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     58.00 =    1630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     61.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   468.00  DOWNSTREAM(FEET) =   467.00
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.99
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.39
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   11.50
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     61.00 =    1725.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     61.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.50
  RAINFALL INTENSITY(INCH/HR) =   1.40
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =      15.64
  TOTAL STREAM AREA(ACRES) =      15.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.39

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     60.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
  ELEVATION DATA: UPSTREAM(FEET) =    480.00  DOWNSTREAM(FEET) =    477.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.760
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.386
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 D        1.10      0.20      0.850    57   11.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      1.10   PEAK FLOW RATE(CFS) =      1.20

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   477.00  DOWNSTREAM(FEET) =   467.00
  FLOW LENGTH(FEET) =   755.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.20
  PIPE TRAVEL TIME(MIN.) =   2.99    Tc(MIN.) =   14.75
```

```
 LONGEST FLOWPATH FROM NODE     59.00 TO NODE     61.00 =    1050.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     61.00 TO NODE     61.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   14.75
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.217
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        8.75      0.20     0.850    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    8.75      SUBAREA RUNOFF(CFS) =    8.24
 EFFECTIVE AREA(ACRES) =      9.85   AREA-AVERAGED Fm(INCH/HR) =  0.17
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.85
 TOTAL AREA(ACRES) =        9.9       PEAK FLOW RATE(CFS) =       9.28

****************************************************************************
 FLOW PROCESS FROM NODE     61.00 TO NODE     61.00 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.) =   14.75
 RAINFALL INTENSITY(INCH/HR) =   1.22
 AREA-AVERAGED Fm(INCH/HR) =  0.17
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.85
 EFFECTIVE STREAM AREA(ACRES) =       9.85
 TOTAL STREAM AREA(ACRES) =       9.85
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.28

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.78    6.40    1.964  0.20( 0.04) 0.19       9.0      53.00
     1       20.51    8.92    1.623  0.20( 0.04) 0.19      12.9      56.00
     1       20.87    9.67    1.550  0.20( 0.04) 0.19      13.7      51.00
     1       21.39   11.50    1.404  0.20( 0.04) 0.19      15.6      48.00
     2        9.28   14.75    1.217  0.20( 0.17) 0.85       9.9      59.00

 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       24.68    6.40    1.964  0.20( 0.08) 0.40      13.3      53.00
     2       28.31    8.92    1.623  0.20( 0.08) 0.40      18.8      56.00
     3       28.89    9.67    1.550  0.20( 0.08) 0.40      20.2      51.00
     4       29.92   11.50    1.404  0.20( 0.08) 0.41      23.3      48.00
     5       27.74   14.75    1.217  0.20( 0.09) 0.45      25.5      59.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      29.92    Tc(MIN.) =    11.50
 EFFECTIVE AREA(ACRES) =      23.32   AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.41
 TOTAL AREA(ACRES) =       25.5
 LONGEST FLOWPATH FROM NODE     48.00 TO NODE     61.00 =    1725.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   467.00  DOWNSTREAM(FEET) =   466.00
 FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.11
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      29.92
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =   11.74
 LONGEST FLOWPATH FROM NODE     48.00 TO NODE     62.00 =    1845.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       24.68    6.67    1.919  0.20( 0.08) 0.40      13.3      53.00
     2       28.31    9.17    1.598  0.20( 0.08) 0.40      18.8      56.00
     3       28.89    9.92    1.528  0.20( 0.08) 0.40      20.2      51.00
     4       29.92   11.74    1.387  0.20( 0.08) 0.41      23.3      48.00
     5       27.74   15.00    1.205  0.20( 0.09) 0.45      25.5      59.00
 LONGEST FLOWPATH FROM NODE     48.00 TO NODE     62.00 =    1845.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       43.78    9.09    1.606  0.20( 0.04) 0.20      20.2      34.00
     2       43.78    9.09    1.606  0.20( 0.04) 0.20      20.2      40.00
     3       44.75    9.46    1.570  0.20( 0.04) 0.20      21.5      42.00
     4       45.51    9.76    1.542  0.20( 0.04) 0.20      22.5      40.00
     5       46.97   10.37    1.489  0.20( 0.04) 0.20      24.4      44.00
     6       47.89   10.73    1.460  0.20( 0.04) 0.19      25.7      40.00
     7       48.64   11.06    1.435  0.20( 0.04) 0.19      26.9      22.00
     8       48.82   11.15    1.428  0.20( 0.04) 0.19      27.1      37.00
     9       51.10   12.52    1.336  0.20( 0.04) 0.19      31.4      29.00
    10       51.43   12.88    1.315  0.20( 0.04) 0.19      32.3      17.00
    11       51.92   13.34    1.289  0.20( 0.04) 0.19      33.7      14.00
    12       52.40   13.99    1.254  0.20( 0.04) 0.19      35.5      24.00
    13       52.36   14.13    1.247  0.20( 0.04) 0.19      35.8      19.00
    14       50.38   16.15    1.155  0.20( 0.04) 0.19      38.3       5.00
    15       49.02   18.16    1.080  0.20( 0.04) 0.19      41.0       8.00
    16       48.78   18.47    1.069  0.20( 0.04) 0.19      41.4       1.00
    17       48.49   18.64    1.064  0.20( 0.04) 0.19      41.4      11.00
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     62.00 =    4560.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       63.21    6.67    1.919  0.20( 0.06) 0.30      28.1      53.00
     2       71.97    9.09    1.606  0.20( 0.06) 0.30      38.8      34.00
     3       71.97    9.09    1.606  0.20( 0.06) 0.30      38.8      40.00
     4       72.31    9.17    1.598  0.20( 0.06) 0.29      39.3      56.00
     5       73.28    9.46    1.570  0.20( 0.06) 0.29      40.8      42.00
     6       74.28    9.76    1.542  0.20( 0.06) 0.29      42.3      40.00
     7       74.78    9.92    1.528  0.20( 0.06) 0.29      43.1      51.00
     8       76.11   10.37    1.489  0.20( 0.06) 0.29      45.4      44.00
     9       77.24   10.73    1.460  0.20( 0.06) 0.29      47.3      40.00
    10       78.18   11.06    1.435  0.20( 0.06) 0.29      49.0      22.00
    11       78.40   11.15    1.428  0.20( 0.06) 0.29      49.4      37.00
    12       79.72   11.74    1.387  0.20( 0.06) 0.29      52.3      48.00
    13       80.49   12.52    1.336  0.20( 0.06) 0.29      55.3      29.00
    14       80.59   12.88    1.315  0.20( 0.06) 0.29      56.4      17.00
    15       80.77   13.34    1.289  0.20( 0.06) 0.29      58.1      14.00
    16       80.82   13.99    1.254  0.20( 0.06) 0.29      60.3      24.00
    17       80.68   14.13    1.247  0.20( 0.06) 0.29      60.7      19.00
    18       79.25   15.00    1.205  0.20( 0.06) 0.29      62.3      59.00
    19       76.87   16.15    1.155  0.20( 0.06) 0.29      63.8       5.00
    20       73.65   18.16    1.080  0.20( 0.06) 0.29      66.5       8.00
    21       73.15   18.47    1.069  0.20( 0.06) 0.29      66.9       1.00
```

```
    22       72.71   18.64    1.064  0.20( 0.06) 0.29      66.9      11.00
   TOTAL AREA(ACRES) =        66.9

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       80.82  Tc(MIN.) =   13.991
  EFFECTIVE AREA(ACRES) =     60.31  AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.29
  TOTAL AREA(ACRES) =       66.9
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     62.00 =    4560.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     62.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       66.9  TC(MIN.) =     13.99
  EFFECTIVE AREA(ACRES) =     60.31  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.291
  PEAK FLOW RATE(CFS)   =      80.82

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       63.21    6.67    1.919  0.20( 0.06) 0.30      28.1      53.00
      2       71.97    9.09    1.606  0.20( 0.06) 0.30      38.8      34.00
      3       71.97    9.09    1.606  0.20( 0.06) 0.30      38.8      40.00
      4       72.31    9.17    1.598  0.20( 0.06) 0.29      39.3      56.00
      5       73.28    9.46    1.570  0.20( 0.06) 0.29      40.8      42.00
      6       74.28    9.76    1.542  0.20( 0.06) 0.29      42.3      40.00
      7       74.78    9.92    1.528  0.20( 0.06) 0.29      43.1      51.00
      8       76.11   10.37    1.489  0.20( 0.06) 0.29      45.4      44.00
      9       77.24   10.73    1.460  0.20( 0.06) 0.29      47.3      40.00
     10       78.18   11.06    1.435  0.20( 0.06) 0.29      49.0      22.00
     11       78.40   11.15    1.428  0.20( 0.06) 0.29      49.4      37.00
     12       79.72   11.74    1.387  0.20( 0.06) 0.29      52.3      48.00
     13       80.49   12.52    1.336  0.20( 0.06) 0.29      55.3      29.00
     14       80.59   12.88    1.315  0.20( 0.06) 0.29      56.4      17.00
     15       80.77   13.34    1.289  0.20( 0.06) 0.29      58.1      14.00
     16       80.82   13.99    1.254  0.20( 0.06) 0.29      60.3      24.00
     17       80.68   14.13    1.247  0.20( 0.06) 0.29      60.7      19.00
     18       79.25   15.00    1.205  0.20( 0.06) 0.29      62.3      59.00
     19       76.87   16.15    1.155  0.20( 0.06) 0.29      63.8       5.00
     20       73.65   18.16    1.080  0.20( 0.06) 0.29      66.5       8.00
     21       73.15   18.47    1.069  0.20( 0.06) 0.29      66.9       1.00
     22       72.71   18.64    1.064  0.20( 0.06) 0.29      66.9      11.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                            Analysis prepared by:

                            HUNSAKER & ASSOCIATES
                                  Irvine,Inc
                        Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  BREA 265, 2-YR STUDY
  PROPOSED CONDITION
  AREA 'A'
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         66.90       29.00       75.(AMC II)     0.200       0.637

    TOTAL AREA (Acres) =     66.90

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.058

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.363
==========================================================================
```

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

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                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                       Planning * Engineering * Surveying
            Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* BREA 265                                                              *
* 2-YR STUDY - PROPOSED CONDITION - WEST                                *
* AREA 'A'                                                              *
 ************************************************************************

  FILE NAME: WP-A.DAT
  TIME/DATE OF STUDY: 10:35 01/14/2022


******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      66.900 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.134 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         STORM RETURN FREQUENCY =    2-YEAR
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.058
         LOW LOSS FRACTION = 0.363
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.19
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.40
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  0.53
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  0.89
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  1.22
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  2.05

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.997
          30-MINUTE FACTOR = 0.997
           1-HOUR FACTOR = 0.997
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  62.143



==============================================================================
                      UNIT HYDROGRAPH DETERMINATION

------------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
```

1	6.866	55.549
2	43.778	298.650
3	83.351	320.167
4	96.304	104.799
5	98.837	20.497
6	99.517	5.501
7	99.807	2.345
8	99.952	1.172
9	100.000	0.391

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 3.3045
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 8.1185

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	22.5	45.0	67.5	90.0
0.083	0.0007	0.09	Q	.	.	.	.
0.167	0.0048	0.60	Q	.	.	.	.
0.250	0.0127	1.15	Q	.	.	.	.
0.333	0.0219	1.33	Q	.	.	.	.
0.417	0.0313	1.37	Q	.	.	.	.
0.500	0.0408	1.38	Q	.	.	.	.
0.583	0.0504	1.39	Q	.	.	.	.
0.667	0.0600	1.40	Q	.	.	.	.
0.750	0.0697	1.40	Q	.	.	.	.
0.833	0.0794	1.41	Q	.	.	.	.
0.917	0.0891	1.41	Q	.	.	.	.
1.000	0.0989	1.42	Q	.	.	.	.
1.083	0.1087	1.42	Q	.	.	.	.
1.167	0.1185	1.43	Q	.	.	.	.
1.250	0.1284	1.43	Q	.	.	.	.
1.333	0.1383	1.44	Q	.	.	.	.
1.417	0.1482	1.44	Q	.	.	.	.
1.500	0.1582	1.45	Q	.	.	.	.
1.583	0.1682	1.45	Q	.	.	.	.
1.667	0.1782	1.46	Q	.	.	.	.
1.750	0.1883	1.46	Q	.	.	.	.
1.833	0.1984	1.47	Q	.	.	.	.
1.917	0.2085	1.47	QV	.	.	.	.
2.000	0.2187	1.48	QV	.	.	.	.
2.083	0.2289	1.48	QV	.	.	.	.
2.167	0.2392	1.49	QV	.	.	.	.
2.250	0.2495	1.50	QV	.	.	.	.
2.333	0.2599	1.50	QV	.	.	.	.
2.417	0.2702	1.51	QV	.	.	.	.
2.500	0.2806	1.51	QV	.	.	.	.
2.583	0.2911	1.52	QV	.	.	.	.
2.667	0.3016	1.52	QV	.	.	.	.
2.750	0.3121	1.53	QV	.	.	.	.
2.833	0.3227	1.54	QV	.	.	.	.
2.917	0.3333	1.54	QV	.	.	.	.
3.000	0.3440	1.55	QV	.	.	.	.
3.083	0.3547	1.55	QV	.	.	.	.
3.167	0.3655	1.56	QV	.	.	.	.
3.250	0.3762	1.57	QV	.	.	.	.
3.333	0.3871	1.57	QV	.	.	.	.
3.417	0.3980	1.58	QV	.	.	.	.
3.500	0.4089	1.59	Q V	.	.	.	.
3.583	0.4198	1.59	Q V	.	.	.	.
3.667	0.4309	1.60	Q V	.	.	.	.
3.750	0.4419	1.61	Q V	.	.	.	.
3.833	0.4530	1.61	Q V	.	.	.	.
3.917	0.4642	1.62	Q V	.	.	.	.
4.000	0.4754	1.63	Q V	.	.	.	.
4.083	0.4866	1.63	Q V	.	.	.	.
4.167	0.4979	1.64	Q V	.	.	.	.
4.250	0.5093	1.65	Q V	.	.	.	.
4.333	0.5207	1.65	Q V	.	.	.	.
4.417	0.5321	1.66	Q V	.	.	.	.
4.500	0.5436	1.67	Q V	.	.	.	.
4.583	0.5552	1.68	Q V	.	.	.	.
4.667	0.5668	1.68	Q V	.	.	.	.
4.750	0.5784	1.69	Q V	.	.	.	.
4.833	0.5901	1.70	Q V	.	.	.	.
4.917	0.6019	1.71	Q V	.	.	.	.
5.000	0.6137	1.72	Q V	.	.	.	.

5.083	0.6256	1.72	Q	V	.	.	.	.
5.167	0.6375	1.73	Q	V	.	.	.	.
5.250	0.6495	1.74	Q	V	.	.	.	.
5.333	0.6615	1.75	Q	V	.	.	.	.
5.417	0.6736	1.76	Q	V	.	.	.	.
5.500	0.6858	1.77	Q	V	.	.	.	.
5.583	0.6980	1.77	Q	V	.	.	.	.
5.667	0.7103	1.78	Q	V	.	.	.	.
5.750	0.7226	1.79	Q	V	.	.	.	.
5.833	0.7350	1.80	Q	V	.	.	.	.
5.917	0.7475	1.81	Q	V	.	.	.	.
6.000	0.7600	1.82	Q	V	.	.	.	.
6.083	0.7726	1.83	Q	V	.	.	.	.
6.167	0.7853	1.84	Q	V	.	.	.	.
6.250	0.7980	1.85	Q	V	.	.	.	.
6.333	0.8108	1.86	Q	V	.	.	.	.
6.417	0.8236	1.87	Q	V	.	.	.	.
6.500	0.8365	1.88	Q	V	.	.	.	.
6.583	0.8495	1.89	Q	V	.	.	.	.
6.667	0.8626	1.90	Q	V	.	.	.	.
6.750	0.8757	1.91	Q	V	.	.	.	.
6.833	0.8890	1.92	Q	V	.	.	.	.
6.917	0.9022	1.93	Q	V	.	.	.	.
7.000	0.9156	1.94	Q	V	.	.	.	.
7.083	0.9290	1.95	Q	V	.	.	.	.
7.167	0.9426	1.96	Q	V	.	.	.	.
7.250	0.9562	1.97	Q	V	.	.	.	.
7.333	0.9698	1.99	Q	V	.	.	.	.
7.417	0.9836	2.00	Q	V	.	.	.	.
7.500	0.9974	2.01	Q	V	.	.	.	.
7.583	1.0113	2.02	Q	V	.	.	.	.
7.667	1.0253	2.03	Q	V	.	.	.	.
7.750	1.0394	2.05	Q	V	.	.	.	.
7.833	1.0536	2.06	Q	V	.	.	.	.
7.917	1.0679	2.07	Q	V	.	.	.	.
8.000	1.0822	2.08	Q	V	.	.	.	.
8.083	1.0967	2.10	Q	V	.	.	.	.
8.167	1.1112	2.11	Q	V	.	.	.	.
8.250	1.1259	2.13	Q	V	.	.	.	.
8.333	1.1406	2.14	Q	V	.	.	.	.
8.417	1.1554	2.15	Q	V	.	.	.	.
8.500	1.1704	2.17	Q	V	.	.	.	.
8.583	1.1854	2.18	Q	V	.	.	.	.
8.667	1.2005	2.20	Q	V	.	.	.	.
8.750	1.2158	2.21	Q	V	.	.	.	.
8.833	1.2311	2.23	Q	V	.	.	.	.
8.917	1.2466	2.24	Q	V	.	.	.	.
9.000	1.2622	2.26	.Q	V	.	.	.	.
9.083	1.2778	2.28	.Q	V	.	.	.	.
9.167	1.2936	2.29	.Q	V	.	.	.	.
9.250	1.3096	2.31	.Q	V	.	.	.	.
9.333	1.3256	2.33	.Q	V	.	.	.	.
9.417	1.3418	2.35	.Q	V	.	.	.	.
9.500	1.3580	2.37	.Q	V	.	.	.	.
9.583	1.3745	2.38	.Q	V	.	.	.	.
9.667	1.3910	2.40	.Q	V	.	.	.	.
9.750	1.4077	2.42	.Q	V	.	.	.	.
9.833	1.4245	2.44	.Q	V	.	.	.	.
9.917	1.4415	2.46	.Q	V	.	.	.	.
10.000	1.4586	2.48	.Q	V	.	.	.	.
10.083	1.4758	2.50	.Q	V	.	.	.	.
10.167	1.4932	2.53	.Q	V	.	.	.	.
10.250	1.5107	2.55	.Q	V	.	.	.	.
10.333	1.5284	2.57	.Q	V	.	.	.	.
10.417	1.5463	2.59	.Q	V	.	.	.	.
10.500	1.5643	2.62	.Q	V	.	.	.	.
10.583	1.5825	2.64	.Q	V	.	.	.	.
10.667	1.6008	2.67	.Q	V	.	.	.	.
10.750	1.6194	2.69	.Q	V	.	.	.	.
10.833	1.6381	2.72	.Q	V	.	.	.	.
10.917	1.6570	2.74	.Q	V	.	.	.	.

11.000	1.6760	2.77	.Q V . . . .
11.083	1.6953	2.80	.Q V . . . .
11.167	1.7148	2.83	.Q V . . . .
11.250	1.7345	2.86	.Q V . . . .
11.333	1.7544	2.89	.Q V . . . .
11.417	1.7745	2.92	.Q V . . . .
11.500	1.7948	2.95	.Q V . . . .
11.583	1.8153	2.98	.Q V . . . .
11.667	1.8361	3.02	.Q V. . . .
11.750	1.8571	3.05	.Q V. . . .
11.833	1.8784	3.09	.Q V. . . .
11.917	1.9000	3.13	.Q V. . . .
12.000	1.9218	3.17	.Q V. . . .
12.083	1.9442	3.25	.Q V. . . .
12.167	1.9687	3.56	.Q V. . . .
12.250	1.9954	3.88	.Q V. . . .
12.333	2.0231	4.02	.Q V. . . .
12.417	2.0512	4.08	.Q V . . .
12.500	2.0797	4.14	.Q V . . .
12.583	2.1085	4.19	.Q V . . .
12.667	2.1378	4.25	.Q V . . .
12.750	2.1674	4.30	.Q V . . .
12.833	2.1974	4.36	.Q V . . .
12.917	2.2279	4.42	.Q V . . .
13.000	2.2587	4.48	.Q .V . . .
13.083	2.2900	4.55	. Q .V . . .
13.167	2.3218	4.61	. Q .V . . .
13.250	2.3541	4.68	. Q .V . . .
13.333	2.3868	4.76	. Q .V . . .
13.417	2.4201	4.83	. Q .V . . .
13.500	2.4539	4.91	. Q . V . . .
13.583	2.4884	5.00	. Q . V . . .
13.667	2.5234	5.09	. Q . V . . .
13.750	2.5591	5.18	. Q . V . . .
13.833	2.5954	5.28	. Q . V . . .
13.917	2.6325	5.38	. Q . V . . .
14.000	2.6703	5.49	. Q . V . . .
14.083	2.7091	5.62	. Q . V . . .
14.167	2.7493	5.84	. Q . V . . .
14.250	2.7910	6.06	. Q . V . . .
14.333	2.8340	6.24	. Q . V . . .
14.417	2.8780	6.39	. Q . V . . .
14.500	2.9232	6.56	. Q . V . . .
14.583	2.9696	6.74	. Q . V . . .
14.667	3.0177	6.99	. Q . V . . .
14.750	3.0679	7.29	. Q . V . . .
14.833	3.1205	7.64	. Q . V . . .
14.917	3.1757	8.02	. Q . V . . .
15.000	3.2339	8.45	. Q . V . . .
15.083	3.2953	8.92	. Q . V . . .
15.167	3.3604	9.46	. Q . V . . .
15.250	3.4297	10.05	. Q . V . . .
15.333	3.5037	10.75	. Q . V . . .
15.417	3.5820	11.37	. Q . V . . .
15.500	3.6607	11.42	. Q . V . . .
15.583	3.7404	11.57	. Q . V . . .
15.667	3.8276	12.66	. Q . V . . .
15.750	3.9267	14.39	. Q . V. . . .
15.833	4.0441	17.05	. Q . V. . . .
15.917	4.1878	20.87	. Q. V . . .
16.000	4.3782	27.65	. . Q .V . . .
16.083	4.6852	44.58	. . Q. V . . .
16.167	5.2417	80.80	. . . V . Q .
16.250	5.7746	77.37	. . . V . Q .
16.333	6.0403	38.59	. . Q . V. . .
16.417	6.1779	19.97	. Q . . V . .
16.500	6.2778	14.52	. Q . . V . .
16.583	6.3635	12.43	. Q . . .V . .
16.667	6.4378	10.79	. Q . . .V . .
16.750	6.5027	9.42	. Q . . . V . .
16.833	6.5603	8.37	. Q . . . V . .

| | | |

22.833	7.9611	1.55	Q	.	.	.	V.
22.917	7.9717	1.53	Q	.	.	.	V.
23.000	7.9821	1.52	Q	.	.	.	V.
23.083	7.9926	1.51	Q	.	.	.	V.
23.167	8.0029	1.50	Q	.	.	.	V.
23.250	8.0131	1.49	Q	.	.	.	V.
23.333	8.0233	1.48	Q	.	.	.	V.
23.417	8.0334	1.47	Q	.	.	.	V.
23.500	8.0434	1.46	Q	.	.	.	V.
23.583	8.0534	1.45	Q	.	.	.	V.
23.667	8.0633	1.44	Q	.	.	.	V.
23.750	8.0731	1.43	Q	.	.	.	V.
23.833	8.0828	1.42	Q	.	.	.	V.
23.917	8.0925	1.41	Q	.	.	.	V.
24.000	8.1021	1.40	Q	.	.	.	V.
24.083	8.1111	1.29	Q	.	.	.	V.
24.167	8.1164	0.78	Q	.	.	.	V.
24.250	8.1180	0.23	Q	.	.	.	V.
24.333	8.1184	0.05	Q	.	.	.	V.
24.417	8.1185	0.02	Q	.	.	.	V.
24.500	8.1185	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	115.0
20%	40.0
30%	25.0
40%	20.0
50%	15.0
60%	10.0
70%	10.0
80%	10.0
90%	10.0

END OF FLOODSCx ROUTING ANALYSIS

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                      Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* W.O. #4213-3X, BREA CENTRAL                                           *
* 2-YR STUDY                                                            *
* PROPOSED - WEST AREA - DRAINAGE AREA 'B'                              *
 ************************************************************************

  FILE NAME: WEST-B.DAT
  TIME/DATE OF STUDY: 11:26 11/09/2021
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  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) I 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   20.0     15.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    508.00  DOWNSTREAM(FEET) =    505.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.567
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.560
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       D        1.00      0.20     0.500    57    9.57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA RUNOFF(CFS) =      1.31
  TOTAL AREA(ACRES) =      1.00   PEAK FLOW RATE(CFS) =      1.31

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

```
 FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   505.00  DOWNSTREAM(FEET) =   497.00
 FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.10
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.31
 PIPE TRAVEL TIME(MIN.) =   2.85    Tc(MIN.) =   12.41
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1000.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.41
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.343
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        D       10.02      0.20     0.500    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
 SUBAREA AREA(ACRES) =   10.02      SUBAREA RUNOFF(CFS) =   11.21
 EFFECTIVE AREA(ACRES) =     11.02   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
 TOTAL AREA(ACRES) =       11.0       PEAK FLOW RATE(CFS) =      12.33

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   497.00  DOWNSTREAM(FEET) =   482.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.79
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.33
 PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =   13.16
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1480.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
 ELEVATION DATA: UPSTREAM(FEET) =    502.50  DOWNSTREAM(FEET) =    497.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.751
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.905
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  D        0.60      0.20     0.100    57    6.75
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.02
  TOTAL AREA(ACRES) =      0.60   PEAK FLOW RATE(CFS) =      1.02

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      8.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  497.50  DOWNSTREAM ELEVATION(FEET) =  484.00
  STREET LENGTH(FEET) =   720.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.02
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.71
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   4.42   Tc(MIN.) =   11.17
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.427
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        1.57      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.57      SUBAREA RUNOFF(CFS) =    1.99
  EFFECTIVE AREA(ACRES) =      2.17    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =       2.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.44
  FLOW VELOCITY(FEET/SEC.) =  2.88   DEPTH*VELOCITY(FT*FT/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      8.00 =    1020.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.17
  RAINFALL INTENSITY(INCH/HR) =   1.43
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.17
  TOTAL STREAM AREA(ACRES) =       2.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.75

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   720.00
```

```
  USER SPECIFIED Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  ".4 DWELLING/ACRE"         D        1.03      0.20     0.900    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      1.93
  TOTAL AREA(ACRES) =      1.03   PEAK FLOW RATE(CFS) =      1.93

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   485.00  DOWNSTREAM(FEET) =   484.00
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.93
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    5.28
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE      8.00 =     800.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.28
  RAINFALL INTENSITY(INCH/HR) =   2.19
  AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.90
  EFFECTIVE STREAM AREA(ACRES) =       1.03
  TOTAL STREAM AREA(ACRES) =       1.03
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.93

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        2.75   11.17    1.427  0.20( 0.02) 0.10       2.2       4.00
      2        1.93    5.28    2.194  0.20( 0.18) 0.90       1.0       6.00

  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        3.94    5.28    2.194  0.20( 0.10) 0.50       2.1       6.00
      2        3.94   11.17    1.427  0.20( 0.07) 0.36       3.2       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.94    Tc(MIN.) =    11.17
  EFFECTIVE AREA(ACRES) =       3.20   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =        3.2
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      8.00 =    1020.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE     11.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   484.00  DOWNSTREAM(FEET) =   482.00
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.97
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.94
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   11.40
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE     11.00 =    1115.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.94    5.51    2.141  0.20( 0.10) 0.50       2.1       6.00
      2        3.94   11.40    1.410  0.20( 0.07) 0.36       3.2       4.00
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE     11.00 =    1115.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.33   13.16    1.299  0.20( 0.10) 0.50      11.0       1.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1480.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.73    5.51    2.141  0.20( 0.10) 0.50       6.7       6.00
      2       15.62   11.40    1.410  0.20( 0.09) 0.46      12.8       4.00
      3       15.94   13.16    1.299  0.20( 0.09) 0.47      14.2       1.00
    TOTAL AREA(ACRES) =        14.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       15.94  Tc(MIN.) =   13.156
  EFFECTIVE AREA(ACRES) =     14.22  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.47
  TOTAL AREA(ACRES) =       14.2
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1480.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.16
  RAINFALL INTENSITY(INCH/HR) =   1.30
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.47
  EFFECTIVE STREAM AREA(ACRES) =      14.22
  TOTAL STREAM AREA(ACRES) =      14.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.94

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    505.00  DOWNSTREAM(FEET) =    497.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.225
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.996
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.54      0.20     0.100    57    6.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.96
  TOTAL AREA(ACRES) =      0.54   PEAK FLOW RATE(CFS) =      0.96

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  497.50  DOWNSTREAM ELEVATION(FEET) =  482.00
  STREET LENGTH(FEET) =   795.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  45.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    7.68
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.79
  STREET FLOW TRAVEL TIME(MIN.) =   4.92   Tc(MIN.) =   11.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.429
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        1.43      0.20     0.100    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.43      SUBAREA RUNOFF(CFS) =    1.81
  EFFECTIVE AREA(ACRES) =      1.97    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       2.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   8.91
  FLOW VELOCITY(FEET/SEC.) =  2.87   DEPTH*VELOCITY(FT*FT/SEC.) =   0.91
  LONGEST FLOWPATH FROM NODE      9.00 TO NODE     11.00 =    1095.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     11.00 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.) =   11.14
  RAINFALL INTENSITY(INCH/HR) =   1.43
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.97
 TOTAL STREAM AREA(ACRES) =       1.97
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.50

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.73    5.51    2.141  0.20( 0.10) 0.50       6.7       6.00
     1       15.62   11.40    1.410  0.20( 0.09) 0.46      12.8       4.00
     1       15.94   13.16    1.299  0.20( 0.09) 0.47      14.2       1.00
     2        2.50   11.14    1.429  0.20( 0.02) 0.10       2.0       9.00

 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       14.59    5.51    2.141  0.20( 0.09) 0.45       7.6       6.00
     2       17.99   11.14    1.429  0.20( 0.08) 0.42      14.5       9.00
     3       18.08   11.40    1.410  0.20( 0.08) 0.42      14.7       4.00
     4       18.21   13.16    1.299  0.20( 0.08) 0.42      16.2       1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      18.21    Tc(MIN.) =    13.16
 EFFECTIVE AREA(ACRES) =      16.19   AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.42
 TOTAL AREA(ACRES) =       16.2
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     11.00 =    1480.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       16.2  TC(MIN.) =     13.16
 EFFECTIVE AREA(ACRES) =     16.19  AREA-AVERAGED Fm(INCH/HR)=  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.423
 PEAK FLOW RATE(CFS)   =      18.21

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       14.59    5.51    2.141  0.20( 0.09) 0.45       7.6       6.00
     2       17.99   11.14    1.429  0.20( 0.08) 0.42      14.5       9.00
     3       18.08   11.40    1.410  0.20( 0.08) 0.42      14.7       4.00
     4       18.21   13.16    1.299  0.20( 0.08) 0.42      16.2       1.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                            Analysis prepared by:

                            HUNSAKER & ASSOCIATES
                                  Irvine,Inc
                        Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  BREA 265, 2-YR STUDY
  PROPOSED CONDITION
  AREA 'B'
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         16.20       42.00       75.(AMC II)     0.200       0.523

    TOTAL AREA (Acres) =     16.20

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.084

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.477
==========================================================================
```

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

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                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                     Planning * Engineering * Surveying
           Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* BREA 265                                                              *
* 2-YR STUDY - PROPOSED CONDITION - WEST                                *
* AREA 'B'                                                              *
 ************************************************************************

  FILE NAME: WP-B.DAT
  TIME/DATE OF STUDY: 10:55 01/14/2022


**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      16.200 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.176 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         STORM RETURN FREQUENCY =    2-YEAR
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.084
         LOW LOSS FRACTION = 0.477
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.19
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.40
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  0.53
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  0.89
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  1.22
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  2.05

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  47.483



==========================================================================
                      UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
```

1	4.024	7.884
2	26.902	44.823
3	63.826	72.339
4	87.472	46.327
5	96.118	16.941
6	98.490	4.647
7	99.323	1.632
8	99.729	0.795
9	99.932	0.398
10	100.000	0.133

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 1.0737
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 1.6929

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	5.0	10.0	15.0	20.0
0.083	0.0001	0.01	Q	.	.	.	.
0.167	0.0006	0.07	Q	.	.	.	.
0.250	0.0018	0.17	Q	.	.	.	.
0.333	0.0034	0.24	Q	.	.	.	.
0.417	0.0053	0.26	Q	.	.	.	.
0.500	0.0071	0.27	Q	.	.	.	.
0.583	0.0090	0.27	Q	.	.	.	.
0.667	0.0109	0.28	Q	.	.	.	.
0.750	0.0128	0.28	Q	.	.	.	.
0.833	0.0148	0.28	Q	.	.	.	.
0.917	0.0167	0.28	Q	.	.	.	.
1.000	0.0186	0.28	Q	.	.	.	.
1.083	0.0206	0.28	Q	.	.	.	.
1.167	0.0225	0.28	Q	.	.	.	.
1.250	0.0245	0.28	Q	.	.	.	.
1.333	0.0265	0.29	Q	.	.	.	.
1.417	0.0284	0.29	Q	.	.	.	.
1.500	0.0304	0.29	Q	.	.	.	.
1.583	0.0324	0.29	Q	.	.	.	.
1.667	0.0344	0.29	Q	.	.	.	.
1.750	0.0364	0.29	Q	.	.	.	.
1.833	0.0384	0.29	Q	.	.	.	.
1.917	0.0404	0.29	Q	.	.	.	.
2.000	0.0424	0.29	QV	.	.	.	.
2.083	0.0444	0.29	QV	.	.	.	.
2.167	0.0465	0.30	QV	.	.	.	.
2.250	0.0485	0.30	QV	.	.	.	.
2.333	0.0506	0.30	QV	.	.	.	.
2.417	0.0526	0.30	QV	.	.	.	.
2.500	0.0547	0.30	QV	.	.	.	.
2.583	0.0568	0.30	QV	.	.	.	.
2.667	0.0589	0.30	QV	.	.	.	.
2.750	0.0610	0.30	QV	.	.	.	.
2.833	0.0631	0.30	QV	.	.	.	.
2.917	0.0652	0.31	QV	.	.	.	.
3.000	0.0673	0.31	QV	.	.	.	.
3.083	0.0694	0.31	QV	.	.	.	.
3.167	0.0715	0.31	QV	.	.	.	.
3.250	0.0737	0.31	QV	.	.	.	.
3.333	0.0758	0.31	QV	.	.	.	.
3.417	0.0780	0.31	QV	.	.	.	.
3.500	0.0801	0.31	QV	.	.	.	.
3.583	0.0823	0.32	QV	.	.	.	.
3.667	0.0845	0.32	QV	.	.	.	.
3.750	0.0867	0.32	Q V	.	.	.	.
3.833	0.0889	0.32	Q V	.	.	.	.
3.917	0.0911	0.32	Q V	.	.	.	.
4.000	0.0933	0.32	Q V	.	.	.	.
4.083	0.0956	0.32	Q V	.	.	.	.
4.167	0.0978	0.33	Q V	.	.	.	.
4.250	0.1001	0.33	Q V	.	.	.	.
4.333	0.1023	0.33	Q V	.	.	.	.
4.417	0.1046	0.33	Q V	.	.	.	.
4.500	0.1069	0.33	Q V	.	.	.	.
4.583	0.1092	0.33	Q V	.	.	.	.
4.667	0.1115	0.33	Q V	.	.	.	.
4.750	0.1138	0.34	Q V	.	.	.	.
4.833	0.1161	0.34	Q V	.	.	.	.
4.917	0.1184	0.34	Q V	.	.	.	.
5.000	0.1208	0.34	Q V	.	.	.	.

5.083	0.1231	0.34	Q V	.	.	.	.
5.167	0.1255	0.34	Q V	.	.	.	.
5.250	0.1279	0.35	Q V	.	.	.	.
5.333	0.1303	0.35	Q V	.	.	.	.
5.417	0.1327	0.35	Q V	.	.	.	.
5.500	0.1351	0.35	Q V	.	.	.	.
5.583	0.1375	0.35	Q V	.	.	.	.
5.667	0.1399	0.35	Q V	.	.	.	.
5.750	0.1424	0.36	Q V	.	.	.	.
5.833	0.1448	0.36	Q V	.	.	.	.
5.917	0.1473	0.36	Q V	.	.	.	.
6.000	0.1498	0.36	Q V	.	.	.	.
6.083	0.1523	0.36	Q V	.	.	.	.
6.167	0.1548	0.36	Q V	.	.	.	.
6.250	0.1573	0.37	Q V	.	.	.	.
6.333	0.1599	0.37	Q V	.	.	.	.
6.417	0.1624	0.37	Q V	.	.	.	.
6.500	0.1650	0.37	Q V	.	.	.	.
6.583	0.1675	0.37	Q V	.	.	.	.
6.667	0.1701	0.38	Q V	.	.	.	.
6.750	0.1727	0.38	Q V	.	.	.	.
6.833	0.1754	0.38	Q V	.	.	.	.
6.917	0.1780	0.38	Q V	.	.	.	.
7.000	0.1806	0.38	Q V	.	.	.	.
7.083	0.1833	0.39	Q V	.	.	.	.
7.167	0.1860	0.39	Q V	.	.	.	.
7.250	0.1887	0.39	Q V	.	.	.	.
7.333	0.1914	0.39	Q V	.	.	.	.
7.417	0.1941	0.40	Q V	.	.	.	.
7.500	0.1969	0.40	Q V	.	.	.	.
7.583	0.1996	0.40	Q V	.	.	.	.
7.667	0.2024	0.40	Q V	.	.	.	.
7.750	0.2052	0.41	Q V	.	.	.	.
7.833	0.2080	0.41	Q V	.	.	.	.
7.917	0.2108	0.41	Q V	.	.	.	.
8.000	0.2137	0.41	Q V	.	.	.	.
8.083	0.2165	0.42	Q V	.	.	.	.
8.167	0.2194	0.42	Q V	.	.	.	.
8.250	0.2223	0.42	Q V	.	.	.	.
8.333	0.2252	0.42	Q V	.	.	.	.
8.417	0.2282	0.43	Q V	.	.	.	.
8.500	0.2311	0.43	Q V	.	.	.	.
8.583	0.2341	0.43	Q V	.	.	.	.
8.667	0.2371	0.44	Q V	.	.	.	.
8.750	0.2401	0.44	Q V	.	.	.	.
8.833	0.2432	0.44	Q V	.	.	.	.
8.917	0.2462	0.44	Q V	.	.	.	.
9.000	0.2493	0.45	Q V	.	.	.	.
9.083	0.2524	0.45	Q V	.	.	.	.
9.167	0.2555	0.45	Q V	.	.	.	.
9.250	0.2587	0.46	Q V	.	.	.	.
9.333	0.2619	0.46	Q V	.	.	.	.
9.417	0.2651	0.46	Q V	.	.	.	.
9.500	0.2683	0.47	Q V	.	.	.	.
9.583	0.2715	0.47	Q V	.	.	.	.
9.667	0.2748	0.48	Q V	.	.	.	.
9.750	0.2781	0.48	Q V	.	.	.	.
9.833	0.2815	0.48	Q V	.	.	.	.
9.917	0.2848	0.49	Q V	.	.	.	.
10.000	0.2882	0.49	Q V	.	.	.	.
10.083	0.2916	0.50	Q V	.	.	.	.
10.167	0.2951	0.50	Q V	.	.	.	.
10.250	0.2985	0.50	.Q V	.	.	.	.
10.333	0.3020	0.51	.Q V	.	.	.	.
10.417	0.3056	0.51	.Q V	.	.	.	.
10.500	0.3091	0.52	.Q V	.	.	.	.
10.583	0.3127	0.52	.Q V	.	.	.	.
10.667	0.3164	0.53	.Q V	.	.	.	.
10.750	0.3200	0.53	.Q V	.	.	.	.
10.833	0.3237	0.54	.Q V	.	.	.	.
10.917	0.3275	0.54	.Q V	.	.	.	.

11.000	0.3312	0.55	.Q V . . . .
11.083	0.3350	0.55	.Q V . . . .
11.167	0.3389	0.56	.Q V . . . .
11.250	0.3428	0.56	.Q V . . . .
11.333	0.3467	0.57	.Q V . . . .
11.417	0.3507	0.58	.Q V . . . .
11.500	0.3547	0.58	.Q V . . . .
11.583	0.3588	0.59	.Q V . . . .
11.667	0.3629	0.60	.Q V . . . .
11.750	0.3670	0.60	.Q V . . . .
11.833	0.3712	0.61	.Q V . . . .
11.917	0.3755	0.62	.Q V . . . .
12.000	0.3798	0.63	.Q V . . . .
12.083	0.3842	0.64	.Q V. . . .
12.167	0.3889	0.68	.Q V. . . .
12.250	0.3940	0.74	.Q V. . . .
12.333	0.3994	0.78	.Q V. . . .
12.417	0.4049	0.80	.Q V. . . .
12.500	0.4105	0.82	.Q V. . . .
12.583	0.4162	0.83	.Q V. . . .
12.667	0.4220	0.84	.Q V. . . .
12.750	0.4278	0.85	.Q V . . .
12.833	0.4337	0.86	.Q V . . .
12.917	0.4397	0.87	.Q V . . .
13.000	0.4458	0.88	.Q V . . .
13.083	0.4520	0.90	.Q V . . .
13.167	0.4583	0.91	.Q V . . .
13.250	0.4646	0.92	.Q V . . .
13.333	0.4711	0.94	.Q .V . . .
13.417	0.4777	0.95	.Q .V . . .
13.500	0.4843	0.97	.Q .V . . .
13.583	0.4911	0.98	.Q .V . . .
13.667	0.4980	1.00	. Q .V . . .
13.750	0.5050	1.02	. Q .V . . .
13.833	0.5122	1.04	. Q . V . . .
13.917	0.5195	1.06	. Q . V . . .
14.000	0.5269	1.08	. Q . V . . .
14.083	0.5345	1.10	. Q . V . . .
14.167	0.5424	1.14	. Q . V . . .
14.250	0.5505	1.18	. Q . V . . .
14.333	0.5589	1.22	. Q . V . . .
14.417	0.5675	1.25	. Q . V . . .
14.500	0.5763	1.28	. Q . V . . .
14.583	0.5854	1.32	. Q . V . . .
14.667	0.5947	1.35	. Q . V . . .
14.750	0.6043	1.39	. Q . V . . .
14.833	0.6142	1.44	. Q . V . . .
14.917	0.6245	1.49	. Q . V . . .
15.000	0.6353	1.57	. Q . V . . .
15.083	0.6468	1.67	. Q . V . . .
15.167	0.6591	1.79	. Q . V . . .
15.250	0.6724	1.93	. Q . V . . .
15.333	0.6868	2.09	. Q . V . . .
15.417	0.7023	2.24	. Q . V . . .
15.500	0.7182	2.32	. Q . V . . .
15.583	0.7345	2.36	. Q . V . . .
15.667	0.7519	2.53	. Q . V . . .
15.750	0.7717	2.87	. Q . V . . .
15.833	0.7951	3.40	. Q . V . . .
15.917	0.8239	4.19	. Q . V. . .
16.000	0.8618	5.50	. Q V . . .
16.083	0.9204	8.51	. . Q .V . .
16.167	1.0233	14.93	. . . V Q. .
16.250	1.1488	18.23	. . . V . Q .
16.333	1.2375	12.87	. . . Q V. .
16.417	1.2854	6.97	. . Q . V .
16.500	1.3134	4.06	. Q . . .V .
16.583	1.3341	3.00	. Q . . .V .
16.667	1.3511	2.47	. Q . . .V .
16.750	1.3653	2.07	. Q . . . V .
16.833	1.3775	1.76	. Q . . . V .

16.917	1.3882	1.55	.	Q	.	.	.	V	.	
17.000	1.3980	1.43	.	Q	.	.	.	V	.	
17.083	1.4072	1.34	.	Q	.	.	.	V	.	
17.167	1.4159	1.26	.	Q	.	.	.	V	.	
17.250	1.4240	1.18	.	Q	.	.	.	V	.	
17.333	1.4317	1.12	.	Q	.	.	.	V	.	
17.417	1.4390	1.07	.	Q	.	.	.	V	.	
17.500	1.4461	1.03	.	Q	.	.	.	V	.	
17.583	1.4529	0.99	.	Q	.	.	.	V	.	
17.667	1.4595	0.96	.	Q	.	.	.	V	.	
17.750	1.4659	0.93	.	Q	.	.	.	V	.	
17.833	1.4721	0.90	.	Q	.	.	.	V	.	
17.917	1.4782	0.88	.	Q	.	.	.	V	.	
18.000	1.4840	0.85	.	Q	.	.	.	V	.	
18.083	1.4897	0.83	.	Q	.	.	.	V	.	
18.167	1.4950	0.77	.	Q	.	.	.	V	.	
18.250	1.4999	0.70	.	Q	.	.	.	V	.	
18.333	1.5044	0.65	.	Q	.	.	.	V	.	
18.417	1.5087	0.63	.	Q	.	.	.	V	.	
18.500	1.5129	0.61	.	Q	.	.	.	V	.	
18.583	1.5170	0.59	.	Q	.	.	.	V	.	
18.667	1.5210	0.58	.	Q	.	.	.	V	.	
18.750	1.5249	0.57	.	Q	.	.	.	V	.	
18.833	1.5287	0.56	.	Q	.	.	.	V	.	
18.917	1.5324	0.54	.	Q	.	.	.	V	.	
19.000	1.5361	0.53	.	Q	.	.	.	V	.	
19.083	1.5397	0.52	.	Q	.	.	.	V	.	
19.167	1.5433	0.51	.	Q	.	.	.	V	.	
19.250	1.5467	0.51	.	Q	.	.	.	V	.	
19.333	1.5502	0.50	Q	.	.	.	.	V	.	
19.417	1.5535	0.49	Q	.	.	.	.	V	.	
19.500	1.5568	0.48	Q	.	.	.	.	V	.	
19.583	1.5601	0.47	Q	.	.	.	.	V	.	
19.667	1.5633	0.47	Q	.	.	.	.	V	.	
19.750	1.5665	0.46	Q	.	.	.	.	V	.	
19.833	1.5696	0.45	Q	.	.	.	.	V	.	
19.917	1.5726	0.45	Q	.	.	.	.	V	.	
20.000	1.5757	0.44	Q	.	.	.	.	V	.	
20.083	1.5786	0.43	Q	.	.	.	.	V	.	
20.167	1.5816	0.43	Q	.	.	.	.	V	.	
20.250	1.5845	0.42	Q	.	.	.	.	V	.	
20.333	1.5874	0.42	Q	.	.	.	.	V	.	
20.417	1.5902	0.41	Q	.	.	.	.	V	.	
20.500	1.5930	0.41	Q	.	.	.	.	V	.	
20.583	1.5958	0.40	Q	.	.	.	.	V	.	
20.667	1.5985	0.40	Q	.	.	.	.	V	.	
20.750	1.6012	0.39	Q	.	.	.	.	V	.	
20.833	1.6038	0.39	Q	.	.	.	.	V	.	
20.917	1.6065	0.38	Q	.	.	.	.	V	.	
21.000	1.6091	0.38	Q	.	.	.	.	V	.	
21.083	1.6117	0.37	Q	.	.	.	.	V	.	
21.167	1.6142	0.37	Q	.	.	.	.	V	.	
21.250	1.6168	0.37	Q	.	.	.	.	V	.	
21.333	1.6193	0.36	Q	.	.	.	.	V	.	
21.417	1.6217	0.36	Q	.	.	.	.	V	.	
21.500	1.6242	0.36	Q	.	.	.	.	V	.	
21.583	1.6266	0.35	Q	.	.	.	.	V	.	
21.667	1.6290	0.35	Q	.	.	.	.	V	.	
21.750	1.6314	0.35	Q	.	.	.	.	V	.	
21.833	1.6337	0.34	Q	.	.	.	.	V	.	
21.917	1.6361	0.34	Q	.	.	.	.	V	.	
22.000	1.6384	0.34	Q	.	.	.	.	V	.	
22.083	1.6407	0.33	Q	.	.	.	.	V	.	
22.167	1.6430	0.33	Q	.	.	.	.	V	.	
22.250	1.6452	0.33	Q	.	.	.	.	V	.	
22.333	1.6474	0.32	Q	.	.	.	.	V	.	
22.417	1.6497	0.32	Q	.	.	.	.	V	.	
22.500	1.6519	0.32	Q	.	.	.	.	V	.	
22.583	1.6540	0.32	Q	.	.	.	.	V	.	
22.667	1.6562	0.31	Q	.	.	.	.	V	.	
22.750	1.6583	0.31	Q	.	.	.	.	V	.	

22.833	1.6605	0.31	Q	.	.	.	V.
22.917	1.6626	0.31	Q	.	.	.	V.
23.000	1.6647	0.30	Q	.	.	.	V.
23.083	1.6667	0.30	Q	.	.	.	V.
23.167	1.6688	0.30	Q	.	.	.	V.
23.250	1.6708	0.30	Q	.	.	.	V.
23.333	1.6729	0.29	Q	.	.	.	V.
23.417	1.6749	0.29	Q	.	.	.	V.
23.500	1.6769	0.29	Q	.	.	.	V.
23.583	1.6789	0.29	Q	.	.	.	V.
23.667	1.6809	0.29	Q	.	.	.	V.
23.750	1.6828	0.28	Q	.	.	.	V.
23.833	1.6848	0.28	Q	.	.	.	V.
23.917	1.6867	0.28	Q	.	.	.	V.
24.000	1.6886	0.28	Q	.	.	.	V.
24.083	1.6904	0.27	Q	.	.	.	V.
24.167	1.6918	0.20	Q	.	.	.	V.
24.250	1.6925	0.10	Q	.	.	.	V.
24.333	1.6928	0.03	Q	.	.	.	V.
24.417	1.6928	0.01	Q	.	.	.	V.
24.500	1.6929	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	95.0
20%	40.0
30%	30.0
40%	20.0
50%	15.0
60%	15.0
70%	15.0
80%	10.0
90%	5.0

END OF FLOODSCx ROUTING ANALYSIS

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******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                        Planning * Engineering * Surveying
           Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY ************************
* W.O. #4213-3X, BREA CENTRAL                                            *
* 2-YR STUDY                                                             *
* PROPOSED - WEST AREA - DRAINAGE AREA 'C'                               *
 ***********************************************************************

  FILE NAME: WEST-C.DAT
  TIME/DATE OF STUDY: 10:42 01/12/2022
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  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) I 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   20.0     15.0    0.018/0.018/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    484.60  DOWNSTREAM(FEET) =    477.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.617
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.927
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        1.24      0.20     0.200    57    6.62
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.11
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      2.11

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```
 FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   477.00  DOWNSTREAM(FEET) =   470.00
 FLOW LENGTH(FEET) =   600.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.73
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.11
 PIPE TRAVEL TIME(MIN.) =   2.11    Tc(MIN.) =    8.73
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     900.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.73
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.644
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        D        5.21      0.20     0.200    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    5.21      SUBAREA RUNOFF(CFS) =    7.52
 EFFECTIVE AREA(ACRES) =      6.45   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        6.4       PEAK FLOW RATE(CFS) =       9.31

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.73
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.644
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"        D        4.09      0.20     0.200    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    4.09      SUBAREA RUNOFF(CFS) =    5.90
 EFFECTIVE AREA(ACRES) =     10.54   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =       10.5       PEAK FLOW RATE(CFS) =      15.21
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       10.5  TC(MIN.) =      8.73
 EFFECTIVE AREA(ACRES) =     10.54  AREA-AVERAGED Fm(INCH/HR)=  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.200
 PEAK FLOW RATE(CFS)   =      15.21
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                            Analysis prepared by:

                            HUNSAKER & ASSOCIATES
                                  Irvine,Inc
                        Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  BREA 265, 2-YR STUDY
  PROPOSED CONDITION
  AREA 'C'
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         10.50       20.00       75.(AMC II)     0.200       0.715

    TOTAL AREA (Acres) =     10.50

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.040

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.285
==========================================================================
```

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

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                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                     Planning * Engineering * Surveying
           Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* BREA 265                                                              *
* 2-YR STUDY - PROPOSED CONDITION - WEST                                *
* AREA 'C'                                                              *
 ************************************************************************

  FILE NAME: WP-C.DAT
  TIME/DATE OF STUDY: 11:13 01/14/2022


**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      10.500 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.108 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         STORM RETURN FREQUENCY =    2-YEAR
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.040
         LOW LOSS FRACTION = 0.285
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.19
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.40
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  0.53
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  0.89
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  1.22
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  2.05

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 1.000
          30-MINUTE FACTOR = 1.000
           1-HOUR FACTOR = 1.000
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  77.375



==========================================================================
                      UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
```

1	10.503	13.337
2	60.658	63.689
3	92.954	41.011
4	98.668	7.257
5	99.521	1.082
6	99.808	0.365
7	99.952	0.183
8	100.000	0.061

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.3943
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 1.3987

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	5.0	10.0	15.0	20.0
0.083	0.0002	0.03	Q	.	.	.	.
0.167	0.0012	0.15	Q	.	.	.	.
0.250	0.0027	0.23	Q	.	.	.	.
0.333	0.0044	0.24	Q	.	.	.	.
0.417	0.0061	0.24	Q	.	.	.	.
0.500	0.0078	0.24	Q	.	.	.	.
0.583	0.0094	0.25	Q	.	.	.	.
0.667	0.0111	0.25	Q	.	.	.	.
0.750	0.0128	0.25	Q	.	.	.	.
0.833	0.0146	0.25	Q	.	.	.	.
0.917	0.0163	0.25	Q	.	.	.	.
1.000	0.0180	0.25	Q	.	.	.	.
1.083	0.0197	0.25	Q	.	.	.	.
1.167	0.0215	0.25	Q	.	.	.	.
1.250	0.0232	0.25	Q	.	.	.	.
1.333	0.0249	0.25	Q	.	.	.	.
1.417	0.0267	0.25	Q	.	.	.	.
1.500	0.0285	0.26	Q	.	.	.	.
1.583	0.0302	0.26	Q	.	.	.	.
1.667	0.0320	0.26	Q	.	.	.	.
1.750	0.0338	0.26	Q	.	.	.	.
1.833	0.0355	0.26	QV	.	.	.	.
1.917	0.0373	0.26	QV	.	.	.	.
2.000	0.0391	0.26	QV	.	.	.	.
2.083	0.0409	0.26	QV	.	.	.	.
2.167	0.0427	0.26	QV	.	.	.	.
2.250	0.0446	0.26	QV	.	.	.	.
2.333	0.0464	0.26	QV	.	.	.	.
2.417	0.0482	0.27	QV	.	.	.	.
2.500	0.0501	0.27	QV	.	.	.	.
2.583	0.0519	0.27	QV	.	.	.	.
2.667	0.0538	0.27	QV	.	.	.	.
2.750	0.0556	0.27	QV	.	.	.	.
2.833	0.0575	0.27	QV	.	.	.	.
2.917	0.0594	0.27	QV	.	.	.	.
3.000	0.0612	0.27	QV	.	.	.	.
3.083	0.0631	0.27	QV	.	.	.	.
3.167	0.0650	0.28	QV	.	.	.	.
3.250	0.0669	0.28	QV	.	.	.	.
3.333	0.0688	0.28	QV	.	.	.	.
3.417	0.0708	0.28	Q V	.	.	.	.
3.500	0.0727	0.28	Q V	.	.	.	.
3.583	0.0746	0.28	Q V	.	.	.	.
3.667	0.0766	0.28	Q V	.	.	.	.
3.750	0.0785	0.28	Q V	.	.	.	.
3.833	0.0805	0.28	Q V	.	.	.	.
3.917	0.0824	0.29	Q V	.	.	.	.
4.000	0.0844	0.29	Q V	.	.	.	.
4.083	0.0864	0.29	Q V	.	.	.	.
4.167	0.0884	0.29	Q V	.	.	.	.
4.250	0.0904	0.29	Q V	.	.	.	.
4.333	0.0924	0.29	Q V	.	.	.	.
4.417	0.0944	0.29	Q V	.	.	.	.
4.500	0.0964	0.29	Q V	.	.	.	.
4.583	0.0985	0.30	Q V	.	.	.	.
4.667	0.1005	0.30	Q V	.	.	.	.
4.750	0.1026	0.30	Q V	.	.	.	.
4.833	0.1047	0.30	Q V	.	.	.	.
4.917	0.1067	0.30	Q V	.	.	.	.
5.000	0.1088	0.30	Q V	.	.	.	.

5.083	0.1109	0.30	Q	V	.	.	.	.
5.167	0.1130	0.31	Q	V	.	.	.	.
5.250	0.1151	0.31	Q	V	.	.	.	.
5.333	0.1173	0.31	Q	V	.	.	.	.
5.417	0.1194	0.31	Q	V	.	.	.	.
5.500	0.1215	0.31	Q	V	.	.	.	.
5.583	0.1237	0.31	Q	V	.	.	.	.
5.667	0.1259	0.31	Q	V	.	.	.	.
5.750	0.1280	0.32	Q	V	.	.	.	.
5.833	0.1302	0.32	Q	V	.	.	.	.
5.917	0.1324	0.32	Q	V	.	.	.	.
6.000	0.1346	0.32	Q	V	.	.	.	.
6.083	0.1369	0.32	Q	V	.	.	.	.
6.167	0.1391	0.32	Q	V	.	.	.	.
6.250	0.1413	0.33	Q	V	.	.	.	.
6.333	0.1436	0.33	Q	V	.	.	.	.
6.417	0.1459	0.33	Q	V	.	.	.	.
6.500	0.1481	0.33	Q	V	.	.	.	.
6.583	0.1504	0.33	Q	V	.	.	.	.
6.667	0.1527	0.33	Q	V	.	.	.	.
6.750	0.1551	0.34	Q	V	.	.	.	.
6.833	0.1574	0.34	Q	V	.	.	.	.
6.917	0.1597	0.34	Q	V	.	.	.	.
7.000	0.1621	0.34	Q	V	.	.	.	.
7.083	0.1645	0.34	Q	V	.	.	.	.
7.167	0.1668	0.35	Q	V	.	.	.	.
7.250	0.1692	0.35	Q	V	.	.	.	.
7.333	0.1717	0.35	Q	V	.	.	.	.
7.417	0.1741	0.35	Q	V	.	.	.	.
7.500	0.1765	0.35	Q	V	.	.	.	.
7.583	0.1790	0.36	Q	V	.	.	.	.
7.667	0.1815	0.36	Q	V	.	.	.	.
7.750	0.1839	0.36	Q	V	.	.	.	.
7.833	0.1865	0.36	Q	V	.	.	.	.
7.917	0.1890	0.37	Q	V	.	.	.	.
8.000	0.1915	0.37	Q	V	.	.	.	.
8.083	0.1941	0.37	Q	V	.	.	.	.
8.167	0.1966	0.37	Q	V	.	.	.	.
8.250	0.1992	0.38	Q	V	.	.	.	.
8.333	0.2018	0.38	Q	V	.	.	.	.
8.417	0.2044	0.38	Q	V	.	.	.	.
8.500	0.2071	0.38	Q	V	.	.	.	.
8.583	0.2097	0.39	Q	V	.	.	.	.
8.667	0.2124	0.39	Q	V	.	.	.	.
8.750	0.2151	0.39	Q	V	.	.	.	.
8.833	0.2178	0.39	Q	V	.	.	.	.
8.917	0.2205	0.40	Q	V	.	.	.	.
9.000	0.2233	0.40	Q	V	.	.	.	.
9.083	0.2260	0.40	Q	V	.	.	.	.
9.167	0.2288	0.41	Q	V	.	.	.	.
9.250	0.2316	0.41	Q	V	.	.	.	.
9.333	0.2345	0.41	Q	V	.	.	.	.
9.417	0.2373	0.41	Q	V	.	.	.	.
9.500	0.2402	0.42	Q	V	.	.	.	.
9.583	0.2431	0.42	Q	V	.	.	.	.
9.667	0.2460	0.42	Q	V	.	.	.	.
9.750	0.2490	0.43	Q	V	.	.	.	.
9.833	0.2520	0.43	Q	V	.	.	.	.
9.917	0.2549	0.43	Q	V	.	.	.	.
10.000	0.2580	0.44	Q	V	.	.	.	.
10.083	0.2610	0.44	Q	V	.	.	.	.
10.167	0.2641	0.45	Q	V	.	.	.	.
10.250	0.2672	0.45	Q	V	.	.	.	.
10.333	0.2703	0.45	Q	V	.	.	.	.
10.417	0.2735	0.46	Q	V	.	.	.	.
10.500	0.2767	0.46	Q	V	.	.	.	.
10.583	0.2799	0.47	Q	V	.	.	.	.
10.667	0.2831	0.47	Q	V	.	.	.	.
10.750	0.2864	0.48	Q	V	.	.	.	.
10.833	0.2897	0.48	Q	V	.	.	.	.
10.917	0.2930	0.48	Q	V	.	.	.	.

11.000	0.2964	0.49	Q V . . . .
11.083	0.2998	0.49	Q V . . . .
11.167	0.3033	0.50	Q V . . . .
11.250	0.3067	0.50	.Q V . . . .
11.333	0.3102	0.51	.Q V . . . .
11.417	0.3138	0.52	.Q V . . . .
11.500	0.3174	0.52	.Q V. . . . .
11.583	0.3210	0.53	.Q V. . . . .
11.667	0.3247	0.53	.Q V. . . . .
11.750	0.3284	0.54	.Q V. . . . .
11.833	0.3322	0.55	.Q V. . . . .
11.917	0.3360	0.55	.Q V. . . . .
12.000	0.3399	0.56	.Q V. . . . .
12.083	0.3438	0.58	.Q V. . . . .
12.167	0.3483	0.65	.Q V. . . . .
12.250	0.3531	0.70	.Q V . . . .
12.333	0.3580	0.71	.Q V . . . .
12.417	0.3630	0.72	.Q V . . . .
12.500	0.3681	0.73	.Q V . . . .
12.583	0.3732	0.74	.Q V . . . .
12.667	0.3783	0.75	.Q V . . . .
12.750	0.3836	0.76	.Q V . . . .
12.833	0.3889	0.77	.Q .V . . . .
12.917	0.3943	0.78	.Q .V . . . .
13.000	0.3997	0.79	.Q .V . . . .
13.083	0.4053	0.80	.Q .V . . . .
13.167	0.4109	0.82	.Q .V . . . .
13.250	0.4166	0.83	.Q .V . . . .
13.333	0.4224	0.84	.Q . V . . . .
13.417	0.4283	0.86	.Q . V . . . .
13.500	0.4343	0.87	.Q . V . . . .
13.583	0.4404	0.89	.Q . V . . . .
13.667	0.4466	0.90	.Q . V . . . .
13.750	0.4529	0.92	.Q . V . . . .
13.833	0.4594	0.94	.Q . V . . . .
13.917	0.4659	0.95	.Q . V . . . .
14.000	0.4726	0.97	.Q . V . . . .
14.083	0.4795	1.00	.Q . V . . . .
14.167	0.4867	1.04	. Q . V . . . .
14.250	0.4942	1.08	. Q . V . . . .
14.333	0.5019	1.12	. Q . V . . . .
14.417	0.5099	1.16	. Q . V . . . .
14.500	0.5182	1.20	. Q . V . . . .
14.583	0.5267	1.24	. Q . V . . . .
14.667	0.5356	1.29	. Q . V . . . .
14.750	0.5449	1.34	. Q . V . . . .
14.833	0.5545	1.40	. Q . V . . . .
14.917	0.5646	1.46	. Q . V . . . .
15.000	0.5752	1.54	. Q . V . . . .
15.083	0.5863	1.61	. Q . V . . . .
15.167	0.5980	1.70	. Q . V . . . .
15.250	0.6104	1.79	. Q . V . . . .
15.333	0.6235	1.91	. Q . V . . . .
15.417	0.6373	2.00	. Q . V . . . .
15.500	0.6509	1.98	. Q . V . . . .
15.583	0.6649	2.03	. Q . V. . . .
15.667	0.6805	2.26	. Q . V. . . .
15.750	0.6980	2.55	. Q . V. . . .
15.833	0.7189	3.04	. Q . V . . .
15.917	0.7444	3.69	. Q . .V . . .
16.000	0.7786	4.98	. Q. . V . . .
16.083	0.8361	8.34	. . Q . V . .
16.167	0.9405	15.17	. . . V Q .
16.250	1.0140	10.66	. . .Q V . .
16.333	1.0451	4.53	. Q. . V. .
16.417	1.0640	2.73	. Q . . V .
16.500	1.0796	2.28	. Q . . V .
16.583	1.0936	2.02	. Q . . .V .
16.667	1.1059	1.78	. Q . . .V .
16.750	1.1168	1.59	. Q . . .V .
16.833	1.1268	1.45	. Q . . . V .

16.917	1.1360	1.33	.	Q	.	.	.	V	.	
17.000	1.1445	1.23	.	Q	.	.	.	V	.	
17.083	1.1524	1.15	.	Q	.	.	.	V	.	
17.167	1.1596	1.06	.	Q	.	.	.	V	.	
17.250	1.1665	0.99	.	Q	.	.	.	V	.	
17.333	1.1730	0.95	.	Q	.	.	.	V	.	
17.417	1.1793	0.91	.	Q	.	.	.	V	.	
17.500	1.1854	0.88	.	Q	.	.	.	V	.	
17.583	1.1912	0.85	.	Q	.	.	.	V	.	
17.667	1.1969	0.82	.	Q	.	.	.	V	.	
17.750	1.2024	0.80	.	Q	.	.	.	V	.	
17.833	1.2078	0.78	.	Q	.	.	.	V	.	
17.917	1.2130	0.76	.	Q	.	.	.	V	.	
18.000	1.2181	0.74	.	Q	.	.	.	V	.	
18.083	1.2230	0.71	.	Q	.	.	.	V	.	
18.167	1.2273	0.63	.	Q	.	.	.	V	.	
18.250	1.2312	0.57	.	Q	.	.	.	V	.	
18.333	1.2350	0.55	.	Q	.	.	.	V	.	
18.417	1.2388	0.54	.	Q	.	.	.	V	.	
18.500	1.2424	0.53	.	Q	.	.	.	V	.	
18.583	1.2459	0.51	.	Q	.	.	.	V	.	
18.667	1.2494	0.50	.	Q	.	.	.	V	.	
18.750	1.2528	0.49	Q	.	.	.	.	V	.	
18.833	1.2561	0.48	Q	.	.	.	.	V	.	
18.917	1.2594	0.47	Q	.	.	.	.	V	.	
19.000	1.2626	0.47	Q	.	.	.	.	V	.	
19.083	1.2657	0.46	Q	.	.	.	.	V	.	
19.167	1.2688	0.45	Q	.	.	.	.	V	.	
19.250	1.2719	0.44	Q	.	.	.	.	V	.	
19.333	1.2748	0.43	Q	.	.	.	.	V	.	
19.417	1.2778	0.43	Q	.	.	.	.	V	.	
19.500	1.2807	0.42	Q	.	.	.	.	V	.	
19.583	1.2835	0.41	Q	.	.	.	.	V	.	
19.667	1.2863	0.41	Q	.	.	.	.	V	.	
19.750	1.2891	0.40	Q	.	.	.	.	V	.	
19.833	1.2918	0.40	Q	.	.	.	.	V	.	
19.917	1.2945	0.39	Q	.	.	.	.	V	.	
20.000	1.2971	0.38	Q	.	.	.	.	V	.	
20.083	1.2998	0.38	Q	.	.	.	.	V	.	
20.167	1.3023	0.37	Q	.	.	.	.	V	.	
20.250	1.3049	0.37	Q	.	.	.	.	V	.	
20.333	1.3074	0.36	Q	.	.	.	.	V	.	
20.417	1.3099	0.36	Q	.	.	.	.	V	.	
20.500	1.3123	0.36	Q	.	.	.	.	V	.	
20.583	1.3147	0.35	Q	.	.	.	.	V	.	
20.667	1.3171	0.35	Q	.	.	.	.	V	.	
20.750	1.3195	0.34	Q	.	.	.	.	V	.	
20.833	1.3218	0.34	Q	.	.	.	.	V	.	
20.917	1.3242	0.34	Q	.	.	.	.	V	.	
21.000	1.3265	0.33	Q	.	.	.	.	V	.	
21.083	1.3287	0.33	Q	.	.	.	.	V	.	
21.167	1.3310	0.33	Q	.	.	.	.	V	.	
21.250	1.3332	0.32	Q	.	.	.	.	V	.	
21.333	1.3354	0.32	Q	.	.	.	.	V	.	
21.417	1.3375	0.32	Q	.	.	.	.	V	.	
21.500	1.3397	0.31	Q	.	.	.	.	V	.	
21.583	1.3418	0.31	Q	.	.	.	.	V	.	
21.667	1.3439	0.31	Q	.	.	.	.	V	.	
21.750	1.3460	0.30	Q	.	.	.	.	V	.	
21.833	1.3481	0.30	Q	.	.	.	.	V	.	
21.917	1.3502	0.30	Q	.	.	.	.	V	.	
22.000	1.3522	0.30	Q	.	.	.	.	V	.	
22.083	1.3542	0.29	Q	.	.	.	.	V	.	
22.167	1.3562	0.29	Q	.	.	.	.	V	.	
22.250	1.3582	0.29	Q	.	.	.	.	V	.	
22.333	1.3602	0.29	Q	.	.	.	.	V	.	
22.417	1.3621	0.28	Q	.	.	.	.	V	.	
22.500	1.3640	0.28	Q	.	.	.	.	V	.	
22.583	1.3659	0.28	Q	.	.	.	.	V	.	
22.667	1.3678	0.28	Q	.	.	.	.	V	.	
22.750	1.3697	0.27	Q	.	.	.	.	V	.	

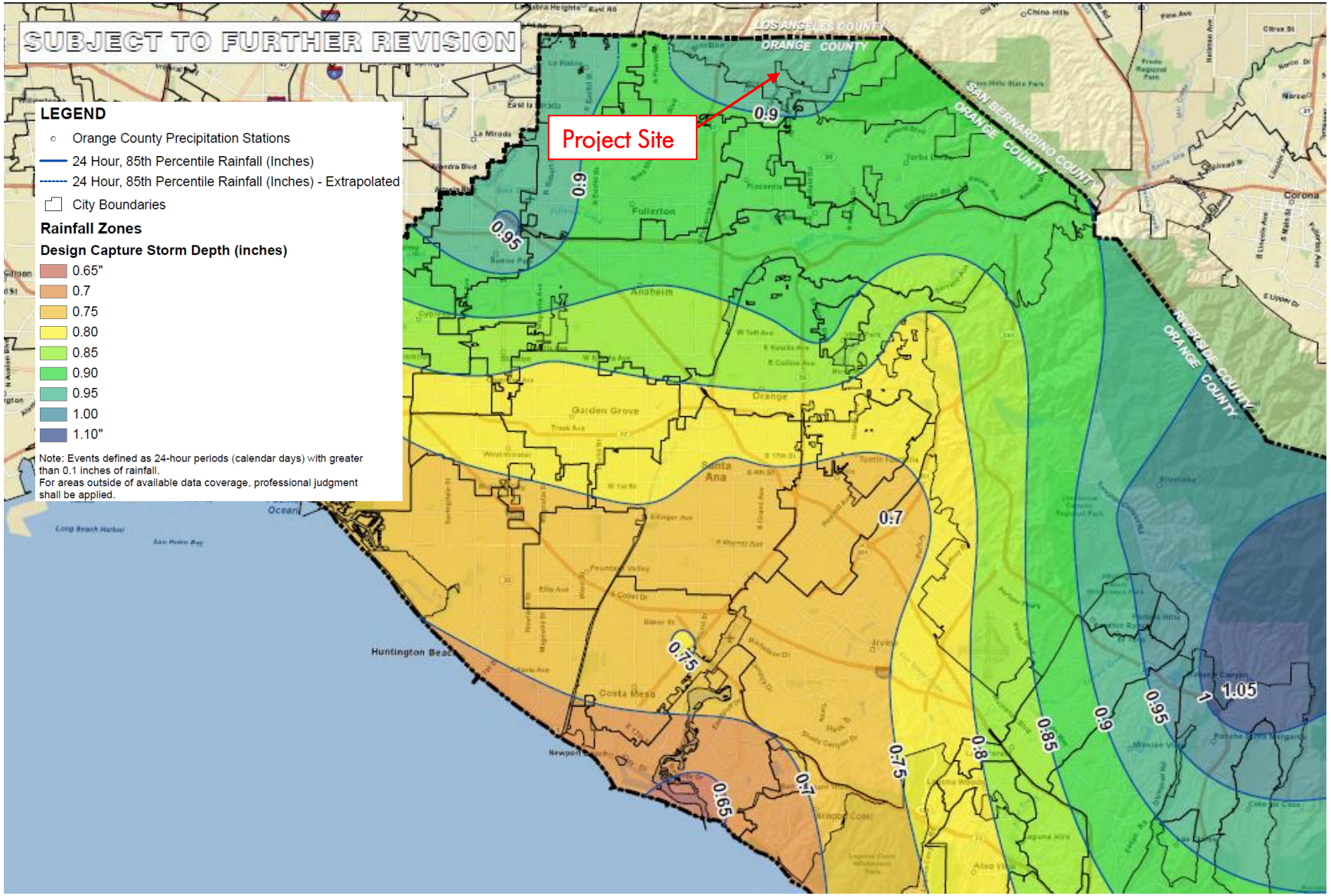
22.833	1.3716	0.27	Q	.	.	.	V.
22.917	1.3735	0.27	Q	.	.	.	V.
23.000	1.3753	0.27	Q	.	.	.	V.
23.083	1.3771	0.27	Q	.	.	.	V.
23.167	1.3789	0.26	Q	.	.	.	V.
23.250	1.3807	0.26	Q	.	.	.	V.
23.333	1.3825	0.26	Q	.	.	.	V.
23.417	1.3843	0.26	Q	.	.	.	V.
23.500	1.3861	0.26	Q	.	.	.	V.
23.583	1.3878	0.25	Q	.	.	.	V.
23.667	1.3896	0.25	Q	.	.	.	V.
23.750	1.3913	0.25	Q	.	.	.	V.
23.833	1.3930	0.25	Q	.	.	.	V.
23.917	1.3947	0.25	Q	.	.	.	V.
24.000	1.3964	0.25	Q	.	.	.	V.
24.083	1.3979	0.22	Q	.	.	.	V.
24.167	1.3986	0.10	Q	.	.	.	V.
24.250	1.3987	0.02	Q	.	.	.	V.
24.333	1.3987	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

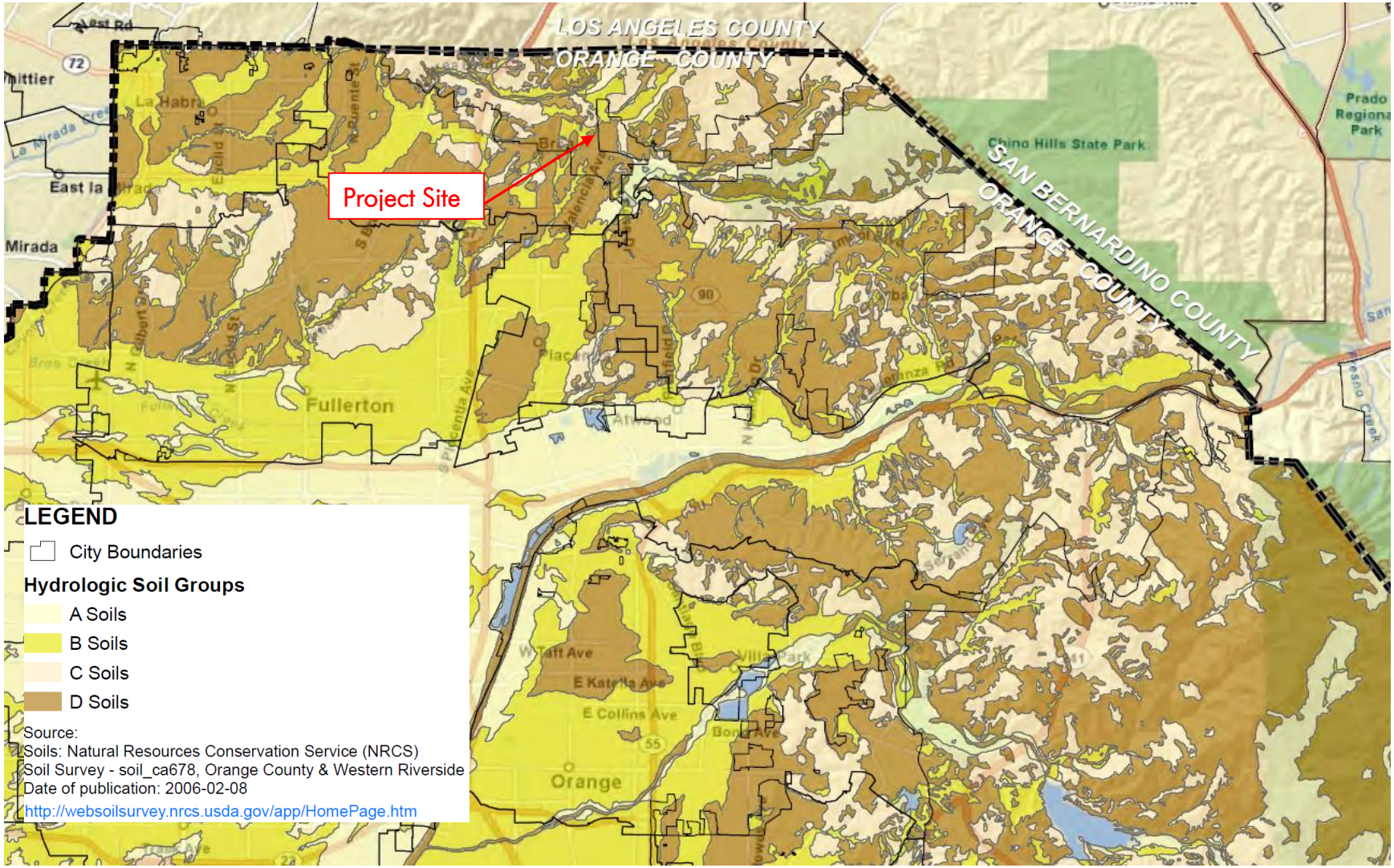
Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1460.0
10%	110.0
20%	35.0
30%	20.0
40%	15.0
50%	15.0
60%	10.0
70%	10.0
80%	5.0
90%	5.0

END OF FLOODSCx ROUTING ANALYSIS

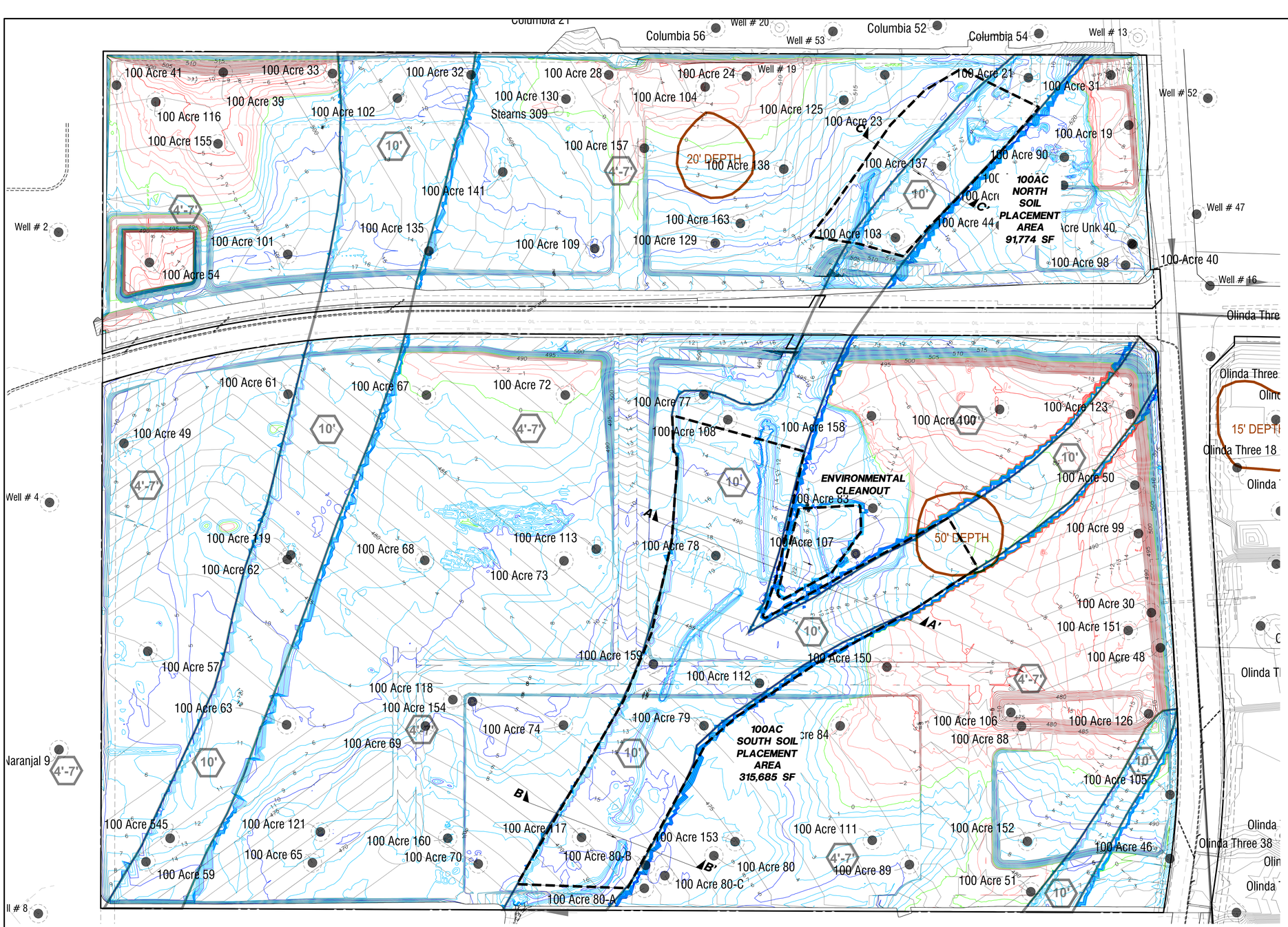
Attachment D – Supporting Project Information



Source: County of Orange TGD – Figure XVI-1 Rainfall Zones



Source: County of Orange TGD – Figure XVI-2a NRCS Hydrologic Soils Group Map



LEGEND - CUT-FILL

- FINISHED GROUND INDEX CONTOUR
- FINISHED GROUND INTERIM CONTOUR
- DELTA BETWEEN CO AND FG SURFACES (CUT), INDEX CONTOUR
- DELTA BETWEEN CO AND FG SURFACES (CUT), INTERIM CONTOUR
- DELTA BETWEEN CO AND FG SURFACES (FILL), INDEX CONTOUR
- DELTA BETWEEN CO AND FG SURFACES (FILL), INTERIM CONTOUR
- CUT/FILL LINE (ZERO CONTOUR)
- OIL WELL
- 10' — SOIL REMOVAL DEPTH
- SOIL REMOVAL LIMIT
- 5' DEPTH — AREA OF CONTAMINATED SOIL

SOIL PLACEMENT 100AC NORTH

DEPTH RANGE (ft)	VOLUME (RAW) (cys)
FG TO 10'	33990
10' TO 15'	16995
15' TO CO	2780
CO TO CO +5' DEEPER	16995

FG = FINISHED GRADE SURFACE, CO = CLEANOUT SURFACE
APPROX. SURFACE AREA OF SOIL PLACEMENT = 50,048 SF

Total Volume of soil to be placed = 28,000 cys
Total Volume 10' or more below FG, to CO = 19,775 cys
Total Volume 15' or more below FG, to CO = 2,780 cys
Total Volume CG to CO excavation, 10' depth = 21,721 cys

Volume of 29,970 cys contained from 12' below FG to CO +5' Deeper.

SOIL PLACEMENT 100AC SOUTH

DEPTH RANGE (ft)	VOLUME (RAW) (cys)
FG TO 10'	116920
10' TO 15'	58460
15' TO CO	14545
CO TO CO +5' DEEPER	58460

FG = FINISHED GRADE SURFACE, CO = CLEANOUT SURFACE
APPROX. SURFACE AREA OF SOIL PLACEMENT = 315,685 SF

Total Volume of soil to be placed = 95,500 cys
Total Volume 10' or more below FG to CO = 73,005 cys
Total Volume 15' or more below FG to CO = 58,460 cys
Total Volume CG to CO excavation, 10' depth = 122,680 cys

Volume of 96,390 cys contained from 13' below FG to CO +5' Deeper.

SOIL PLACEMENT ENVIRONMENTAL CLEANOUT

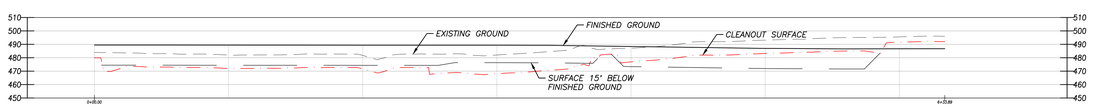
DEPTH RANGE (ft)	VOLUME (RAW) (cys)
FG TO 13'	10656
13' TO CO	3270
CO TO CO +5' DEEPER	4100

FG = FINISHED GRADE SURFACE, CO = CLEANOUT SURFACE
APPROX. SURFACE AREA OF SOIL PLACEMENT = 22,132 SF

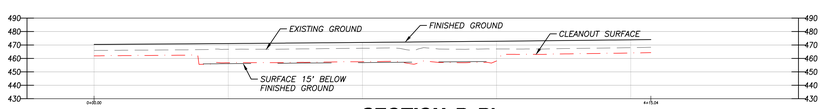
Total Volume of soil to be placed = 95,500 cys
Total Volume 10' or more below FG to CO = 5,700 cys
Total Volume CG to CO excavation, 10' depth = 11,295 cys

Volume of 7,370 cys contained from 13' below FG to CO +5' Deeper.

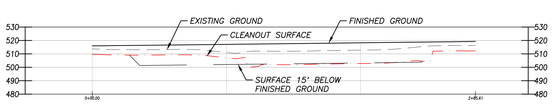
SCALE: 1"=80'
FEET
0 40 80 160
INCHES
0 1/2 1 2



SECTION A-A'
HORZ. SCALE: 1" = 40'
VERT. SCALE: 1" = 40'



SECTION B-B'
HORZ. SCALE: 1" = 40'
VERT. SCALE: 1" = 40'



SECTION C-C'
HORZ. SCALE: 1" = 40'
VERT. SCALE: 1" = 40'

BREA 265 TTM, PHASE 2 (100 AC SITE) SOIL PLACEMENT

FINISHED GROUND VS EXISTING GROUND CLEANOUT CUT-FILL MAP

DATE: Nov. 10, 2021 06:32:13 AM FILE: F:\0477\Planning\OA_Project\Exhibits\EXH_Volumes 2021-07-23 Soil Placement\TTM BREA 265 WEST - SOIL PLACEMENT CUT-FILL.dwg

Attachment E – City Plan Check Correspondence

BREA PUBLIC WORKS

MEMORANDUM

TO: **Wayne Carvalho, Senior Planner**

FROM: Ryan Chapman, PE, Principal Engineer

DATE: February 4, 2021

SUBJECT: **Brea 265 (PLN-2020-00011)**
2nd Preliminary Hydrology Analysis & P-WQMP Comments

The Public Works Department has reviewed the Preliminary Hydrology Analysis and the Preliminary/Conceptual Draft Water Quality Management Plan, dated January 14, 2022 and January 18, 2022 respectively, and has comments as provided below. Please note that additional comments may be provided upon review of subsequent submittal documents and technical studies. Please provide a comment response letter upon resubmittal.

Preliminary Hydrology Analysis Comments

1) Within the Table of Contents:
   a. List all Maps provided in Section 9.
   b. Call out Maps exactly as listed for consistency between the Table of Contents and the body of the report.
   c. Please clearly call out / identify the references used in preparing the document.

2) Methodology Section:
   a. Within the last paragraph, please clarify the following:

> SD system was approved by the City in 2006 (reviewed by Willdan Engineering) and it was designed for the 100-yr storm event of 365cfs. Few profiles on reference plans showed HGL with or without designed flow rate. Some of the reference plans only showed plan view and no profile and HGL.

The 5x8 or the double 48"?

   b. Include within the report, the exhibits that document the downstream capacities. It is stated in the report, and provided comment response, that "H&A did not investigate and/or analyze all the downstream SD Systems". Please clarify why this analysis was not performed. Add an explanation to the responses provided in response (4c).
   c. Define the term "H&A" within the report.
   d. Discuss the overflow areas for all 3 overall areas providing the following information for each:
      i. How were they determined?
      ii. Do they follow existing conditions? If not, how is the overflow mitigated?
      iii. Will the overflow remain in the street right-of-way?

iv. What is the overflow path when not in a street?
v. In the existing condition, are there issues with flooding to the School, adjacent properties, the sports park, etc.?

3) Discussion Section:
   a. Proposed Condition – SOUTHEAST: Clarify if the first sentence should be revised to 10-year instead of 100-year, correcting the report as needed.
   b. Within this section discuss the overflow areas including the following information:
      i. How were they determined?
      ii. Do they follow existing conditions?
      iii. Similar information provided as to what is noted in comment (2d) above.

4) Conclusion:
   a. Correct the punctuation in the first sentence. "…"
   b. Review this section to correct general grammar issues. For example, "and both" vs. "in that both"… Delete "for"…

5) Notes:
   a. Revise the language in the 2nd paragraph of this section as the overall locations of the Water Quality Features and Flood Control Basins that are approved within the entitlement phase of the project will need to be reflected in the construction document phase of the project. The locations of the features noted above are to be consistent between documents.

6) Section 9:
   a. Correct the spelling of "Remainding" to be "Remaining" on all 100-year maps.

Preliminary Water Quality Management Plan (P-WQMP) Comments

7) See the attached P-WQMP Redlines and the WQMP Checklist for comments. These comments are to be addressed upon resubmittal.

Water Quality Management Plan Checklist

City of Brea

The purpose of this checklist is to provide a format for uniform, comprehensive, and well-documented reviews of the Water Quality Management Plans (WQMPs) submitted by project applicants. The completed checklist should be transmitted to the project applicant with the project WQMP. A copy of the completed checklist should be retained with the project planning/permitting file. Upon acceptance of the project's Final WQMP, the property owner shall record a "Covenant and Agreement" with the County-Clerk Recorder or other instrument acceptable to the City to inform future property owners of the requirement to implement the approved project-specific WQMP. The recordation must be incorporated into the WQMP as an appendix prior to final approval.

WQMP (select one): ☒ Preliminary ☐ Final

City Planning Project Number (CD #): CD0449 (PLN-2020-00011)

Project Name: Brea 265

Project Address: Northwest, Southwest and Southeast of Lambert Road and Valencia Avenue, Brea, California

First Review

WQMP Received on: 1/21/2020

Review Completed on: 1/29/2020

Second Review

WQMP Received on: 11-22-2021

Review Completed on: 12-2-2021

Third Review

WQMP Received on: 1-21-2022

Review Completed on: 2-1-2022

Signature of Reviewer: _____ Date: _____

WQMP REQUIREMENT	Requirement Satisfied?		
	Yes	No	N/A
Title Page			
Name of project	X		
Application and/or Tract Number	X		
Lot number(s) if site is a portion of a Tract	X		
Site address (or addresses) and planning area number	X		
Owner/Developer name	X		
Owner/Developer address & telephone number	X		
Consulting/Engineering firm that prepared WQMP	X		
Consulting/Engineering firm address & phone number	X		
Date WQMP was prepared/revised	X		
Owner's Certification			
A signed certification statement, in which the project owner acknowledges and accepts the provisions of the WQMP, follows the title page. Please provide. Will provide prior to approval		X	
Table of Contents			
A Table of Contents, including a list of all figures and attachments is included.	X		
Section 1.0, Permit Numbers and Conditions of Approval			
Lists the Discretionary Permit(s).	X		
The lot & tract/parcel map number describing the subject property.	X		
Lists, verbatim, the Water Quality Conditions, including condition requiring preparation of WQMP, if applicable.	X		
Provides applicable conditions from watershed-based plans including WIHMPs and TMDLs.	X		
Final Resolution of Approval, Conditional Use Permit, etc. is included as an Attachment to the WQMP.	X		
Section 2.0, Project Description			
For All Projects:			
Identifies planning area or community name.	X		
Does the project description completely and accurately describe where facilities will be located, what activities will be conducted and where on the site, what kinds of materials and products will be used, how and where materials will be received and stored, and what kinds of wastes will be generated?	X		
Describes all paved areas, including the type of parking areas.	X		
Describes all landscaped areas.	X		

WQMP REQUIREMENT	Requirement Satisfied?		
	Yes	No	N/A
Describes ownership of all portions of project and site. – Will any infrastructure transfer to public agencies (City, County, Caltrans, etc.)? – Will a homeowners or property owners association will be formed? – Will the association be involved in long term maintenance?	X		
Identifies the potential stormwater or urban runoff pollutants reasonably expected to be associated with the project.	X		
Identifies potential HCOCs.	X		
Identifies post development drainage characteristics.	X		
For Commercial and Industrial Projects:			
– Provides Standard Industrial Classification (SIC) Code which best describes the facilities operations?			X
– Describes the type of use (or uses) for each building or tenant space			X
– Does project include food preparation, cooking, and eating areas (specify location and type of area)			X
– Describes delivery areas and loading docks (specify location and design and if below grade and types of materials expected to be stored			X
– Describes outdoor materials storage areas (describe and depict location(s), specify type(s) of materials expected to be stored)			X
– Describes activities that will be routinely conducted outdoors			X
– Describes any activities associated with equipment or vehicle maintenance and repair, including washing or cleaning. Indicates number of service bays or number of fueling islands/fuel pumps, if applicable.			X
Residential Projects			
– Range of lot and home sizes;	X		
– Describes all community facilities such as, laundry, car wash, swimming pools, jacuzzi, parks, open spaces, tot lots, etc.	X		
Section 3.0, Site Description			
Describes project area and surrounding planning areas in sufficient detail to allow project location to be plotted on a base map.	X		
Provides site address and site size to nearest tenth acre.	X		
Identifies the zoning or land use designation.	X		
Identifies soil types and the quantity and percentage of pervious and impervious surface for pre-project and project conditions.	X		
Describes pre-project site drainage and how it ties into drainage of surrounding or adjacent areas and describes how planned project drainage and how it will tie into drainage of surrounding or adjacent areas.	X		

WQMP REQUIREMENT	Requirement Satisfied?		
	Yes	No	N/A
Identifies the watershed in which the project is located and the : – downstream receiving waters – known water quality impairments as included in the 303(d) List – applicable Total Maximum Daily Loads (TMDLs) – hydrologic conditions of concern, if any.	X		
Identifies known Environmentally Sensitive Areas (ESAs) and Areas of Special Biological Significance (ASBSs) within the vicinity and their proximity to the project.	X		
Section 4.0, Best Management Practices			
Includes applicable performance criteria for the following: hydromodification control, LID criteria, and treatment control BMPs.	X		
Do on-site BMPs include full capture certification or does a separate BMP address the full capture of trash (Connector Pipe Screen, Catch Basin Screen, or equivalent)? *Note only: 1-year, 1-hour sizing calculations and details of Trash Provision FCS BMPs will be required as part of the Final WQMP.* Comment noted.	X		
Includes narrative describing how site design concepts were considered and incorporated into project plans.	X		
Lists and describes all Routine Source Control BMPs (Non-structural and Structural).	X		
Describes the implementation frequency and identifies the entity or party responsible for implementation of each Non-Structural BMP.	X		
If applicable Routine Source Control BMPs were not included, was a reasonable explanation provided?	X		
Lists and describes appropriate Treatment Control BMPs and identifies the design basis (SQDF or SQDV) for the Treatment Control BMPs.	X		
For Routine Non-Structural BMPs N1 (Education for Property Owners, Tenants, and Occupants) and N12 (Employee Training), does the WQMP describe the concepts that will be addressed by the education and training? Is a list of educational materials that will be used provided? Are copies of the educational materials included in an Attachment to the WQMP? *Additional materials will be required in Final WQMP.* Comment noted.	X		
Lists and describes appropriate LID and Hydromodification BMPs and identifies the design basis (SQDF or SQDV) for the LID BMPs. Elaborate on hydromodification BMP sizing in Section IV.3.5 to show how the hydromodification volumes will be detained within the BMPs. For example, in Area A, identify that the 6.15 acre feet of required volume will be provided within a subsurface detention vault that is 23,000 SF in area (from hydrology report) and X' in depth (total volume of Y cubic feet) as well as a bioretention basin with Z cubic feet of capacity. Do this for Areas B and C as well. Ok. Sizing provided in section IV.3.4 of PWQMP		X	

WQMP REQUIREMENT	Requirement Satisfied?		
	Yes	No	N/A
Describes any regional/sub-regional BMPs that will be utilized (NOC).			X
Lists and appropriately calculates any Credits that the Project may qualify for.			X
Lists and describes alternative compliance measures (Treatment Control BMPs, regional programs, Urban Runoff Fund/Mitigation Program participation described if LID BMPs do not fulfill LID and Hydromodification requirements.			X
If applicable, Waiver Request and proof of submittal to the Regional Board Executive Officer included.			X
Section 5.0, Inspection and Maintenance Responsibility for BMPs			
Identifies the entity (or entities) responsible for the long-term inspection and maintenance of all structural source control BMPs and all Treatment Control BMPs, including name, title, company, address, and phone number.	X		
Describes the minimum frequency for inspection and maintenance to ensure the effectiveness of each structural source control BMP and each Treatment Control BMP.	X		
If ownership of the Treatment Control BMPs will be transferred to a public agency, does the WQMP include an Attachment indicating the public agency's intent to accept the Treatment Control BMPs as designed?	X		
Is an appropriate mechanism for the long-term operation and maintenance, including funding, in place?	X		
Section 6.0, Location Map and Plot Plan			
Has an 11" by 17" plot plan been included?	X		
Do all figures, maps, plot plans, etc. have a legend, including a North arrow and scale?	X		
Are all facilities labeled for the intended function?	X		
Are all areas of outdoor activity labeled?	X		
Are all structural BMPs indicated (including GPS coordinates for LID BMPs)? Please add in the GPS coordinates of each BMP to the table in the exhibit. In addition, please provide typical cross section details of the detention vaults proposed in Western Drainage Area to confirm adequate hydromodification BMP capacity is provided. Comment noted. Lat/Long provided in WQMP Site Plan and Section IV.3.4		X	
Is drainage flow information, including general surface flow lines, concrete or other surface ditches or channels, as well as storm drain facilities such as catch basins and underground storm drain pipes depicted? Please show hydromodification sub-drainage areas A, B and C on the WQMP exhibit. In addition, appears DMA 34 is missing a BMP, please provide in WQMP exhibit. Comment noted. BMP Site Plan updated to include requested changes		X	

WQMP REQUIREMENT	Requirement Satisfied?		
	Yes	No	N/A
Depicts where and how on-site drainage ties into the off-site drainage system.	X		
All BMPs proposed/shown on the WQMP exhibit are reflected in the Grading Plans.	X		
The following self-certification statement is provided on the WQMP exhibit: • Self-certifications from a State Licensed Professional Engineer or third-party certifications are required of all BMPs constructed on this plan or Final Certificate of Occupancy will not be granted from the City.			X
Other			
Grading Plans have been provided and include the following statement in the construction notes of the Grading Plans: • Self-certifications from a State Licensed Professional Engineer or third-party certifications are required of all BMPs constructed on this plan or Final Certificate of Occupancy will not be granted from the City. *Please provide as part of Final WQMP.* Comment noted			X
City of Brea "Project Specific WQMP Summary Report" form and Project WQMP Summary Exhibit included? *Please include in Final WQMP.* Comment noted.			X
Has an electronic copy (i.e. PDF) of the WQMP been provided? A scan of the hard copy WQMP is not acceptable. The PDF shall be created from the original electronic source files to minimize file size, provide better quality, and allow for keyword search. The PDF copy shall be submitted via email or via a file transfer service to both abennett@fuscoe.com and briani@ci.brea.ca.us.	X		
Is an Appendix for County recordation of the WQMP included? Recordation of Title Page, Owner Certification Page, Engineer Certification Page, and City of Brea WQMP Summary Page must be recorded before approval can be issued. *Please be sure to follow this process during Final WQMP stage.* Comment noted.	X		
Has an Appendix been provided for WQMP-related correspondence been provided? Please include email pertaining to the WQMP, previous plan check comments, or any specific instructions from plan checkers or City staff • For Final WQMP submittals, the stamped cover page of the approved Preliminary WQMP must be included in this Appendix.	X		
Is the BMP Maintenance Self-Certification Form included in the Appendix? *Include as part of Final WQMP.* Comment noted.			X

WQMP REVIEW SUMMARY

The following is a summary of major concerns relative to this WQMP submittal:

Please see below for main concerns with the current version of the Preliminary WQMP; at this time is not approvable:

- **Hydromod Conceptual BMP Sizing and Detention Detail:** Applicant needs to provide high level details of hydromodification BMP sizing to show there is adequate area for these larger BMPs. In addition, the sub-drainage areas must be shown on the WQMP exhibit. Finally, applicant must provide a typical cross section detail of the proposed detention vaults. Revised as requested.

There are other minor comments summarized in this checklist and in the red lines that must also be addressed. Comments addressed.

REQUIRED FOR ALL SUBMITTALS AND RESUBMITTALS:
Submit an electronic copy to **the Planning Division** and cc Briani@cityofbrea.net Electronic submittals must be original-quality PDFs submitted as an attachment* (**Max 10MB**) or through a file transfer service. *Scans of hard copies will not be accepted*.

FOR FINAL APPROVAL ONLY:
Submit 2 hard copies with recorded version of the following documents:

- Title Page
- Signed Owners Cert Page
- The City of Brea Project Specific WQMP Summary Report Pages

An electronic copy (PDF) is also required per the instructions indicated above. One hard copy will be returned to the owner upon City-stamped approval. Grading Permit will be approved upon submittal of the hard copy WQMPs.

PRELIMINARY/CONCEPTUAL DRAFT WATER QUALITY MANAGEMENT PLAN

Comments provided by Fuscoe Engineering on 1-31-2022.

Project Address:
South of Lambert Road and Valencia Avenue
City of Brea, CA

Prepared For:

3030 Saturn Street, Suite 101
Brea, CA 92821
(714) 577-9154

Prepared By:

Hunsaker & Associates Irvine, Inc.
3 Hughes
Irvine, CA 92618
(949) 583-1010

WQMP Preparation Date:
May 1, 2021
Revised (November 15, 2021; January 18, 2022)

BIOTREATMENT BMP DESIGN SUMMARY						
DMA	DCV_{SIMPLE} (cu-ft)	Q_{BMP} (cfs)	BMP Alternatives	DCV_{BMP} Footprint Required (sf)[1]	Q_{BMP} Footprint Required (sf)[2]	BMP Footprint / Model Provided[4]
34	6,277.5	0.48	PROPRIETARY BIOFILTRATION	--	177.9	TBD
35	1,080.6	0.08	PROPRIETARY BIOFILTRATION	--	30.6	
36	16,911.6	1.24	BASIN WITH PROPRIETARY BIOFILTRATION	--	460.1	
37	3,415.6	0.26	PROPRIETARY BIOFILTRATION	--	96.8	
38	2,978.3	0.23	PROPRIETARY BIOFILTRATION	--	84.4	
39	4,311.2	0.33	PROPRIETARY BIOFILTRATION	--	122.2	
40	3,311.5	0.25	PROPRIETARY BIOFILTRATION	--	93.9	
41	49,299.0	3.62	BASIN WITH PROPRIETARY BIOFILTRATION	--	1,341.3	
42	1,707.8	0.13	PROPRIETARY BIOFILTRATION	--	48.4	
43	1,166.3	0.09	PROPRIETARY BIOFILTRATION	--	33.1	

[1] Based on 1.5' ponding depth.
[2] Based on 0.0027 cfs (1.0 gpm) per sf of proprietary media for flow-based BMPs. This is the typical media flow rate for systems such as Filterra, Focal Point and Modular Wetland System (MWS) units.
[3] Based on 0.0007 cfs (0.26 gpm) per sf of proprietary media with 48 hour draw down. This is based on MWS units configured for volume-based treatment approach.
[4] Minimum footprint for each BMP will be provided in each DMA. Actual manufacturer / model or footprint to be determined.

IV.3.5 Hydromodification Control BMPs

The project is subject to hydromodification. The following BMP will be employed to address project impacts.

HYDROMODIFICATION CONTROL BMPS	
BMP Name	BMP Description
Detention Basin	2 subsurface detention vaults and 1 biofiltration basin BMP located in the project's Western Drainage will be employed to detain the difference in runoff for the 2-year event and larger storms as needed. Sizing of the proposed facilities will be provided to detain the required volume increases provided in Section II.3 as plans are further refined. Sub-Drainage Area "A" – 6.15 ac-ft Sub-Drainage Area "B" – 0.92 ac-ft Sub-Drainage Area "C" – 0.85 ac-ft

Please identify these sub-drainage area labels on the WQMP exhibit. In addition, please also summarize the hydromodification BMPs per sub-drainage area to confirm adequate capacity can be provided within area proposed. See Checklist for more detail.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable to project. Project is not part of any regional or sub-region will employ use of onsite LID BMPs to address project runoff.

IV.3.7 Treatment Control BMPs

The project is able to meet LID requirements onsite. Treatment control BM to the treatment BMP employed to meet current full trash capture requiren

Ok.

BIOTREATMENT BMP DESIGN SUMMARY						
DMA	DCV_{SIMPLE} (cu-ft)	Q_{BMP} (cfs)	BMP Alternatives	DCV_{BMP} Footprint Required (sf)[1]	Q_{BMP} Footprint Required (sf)[2]	BMP Footprint / Model Provided[4]
1	18,901.2	1.39	BIORETENTION WITH UNDERDRAINS, PROPRIETARY BIOFILTRATION	12,600.8	514.3	TBD
2	5,341.5	0.39	PROPRIETARY BIOFILTRATION	--	145.3	
3	4,827.0	0.37	PROPRIETARY BIOFILTRATION	--	136.8	
4	27,197.8	2.00	SUBSURFACE VAULT WITH PROPRIETARY BIOFILTRATION	224.3[3]	740.0	
5	53,046.7	3.90	SUBSURFACE VAULT WITH PROPRIETARY BIOFILTRATION	438.5[3]	1,443.3	
6	94,751.2	6.96	BASIN WITH PROPRIETARY BIOFILTRATION	--	2,578.0	
7	2,006.8	0.15	PROPRIETARY BIOFILTRATION	--	56.9	
8	1,415.0	0.11	PROPRIETARY BIOFILTRATION	--	40.1	
9	668.9	0.05	PROPRIETARY BIOFILTRATION	--	19.0	
10	1,106.3	0.08	PROPRIETARY BIOFILTRATION	--	31.4	
11	2,032.5	0.16	PROPRIETARY BIOFILTRATION	--	57.6	
12	45,726.6	3.36	BASIN WITH PROPRIETARY BIOFILTRATION	--	1,244.1	
13	88,537.3	6.50	BASIN WITH PROPRIETARY BIOFILTRATION	--	2,408.9	
14	6,039.9	0.46	PROPRIETARY BIOFILTRATION	--	171.2	
15	4,915.2	0.38	PROPRIETARY BIOFILTRATION	--	139.3	TBD
16	437.4	0.03	PROPRIETARY BIOFILTRATION	--	12.4	
17	1,687.0	0.13	PROPRIETARY BIOFILTRATION	--	47.8	
18	2,058.2	0.16	PROPRIETARY BIOFILTRATION	--	58.3	
19	849.0	0.06	PROPRIETARY BIOFILTRATION	--	24.1	
20	5,789.9	0.44	PROPRIETARY BIOFILTRATION	--	164.1	
21	1,303.5	0.10	BIORETENTION WITH UNDERDRAINS OR PROPRIETARY BIOFILTRATION	869.0	36.9	
22	2,332.6	0.18	PROPRIETARY BIOFILTRATION	--	66.1	
23	1,666.2	0.13	PROPRIETARY BIOFILTRATION	--	47.2	
24	2,999.1	0.23	PROPRIETARY BIOFILTRATION	--	85.0	
25	6,685.5	0.51	PROPRIETARY BIOFILTRATION	--	189.5	
26	2,624.2	0.20	PROPRIETARY BIOFILTRATION	--	74.4	
27	4,790.2	0.37	PROPRIETARY BIOFILTRATION	--	135.8	
28	463.1	0.04	PROPRIETARY BIOFILTRATION	--	13.1	
29	4,311.2	0.33	PROPRIETARY BIOFILTRATION	--	122.2	
30	3,915.5	0.30	PROPRIETARY BIOFILTRATION	--	111.0	
31	840.4	0.06	PROPRIETARY BIOFILTRATION	--	23.8	
32	2,401.2	0.18	PROPRIETARY BIOFILTRATION	--	68.1	
33	1,641.7	0.13	PROPRIETARY BIOFILTRATION	--	46.5	
34	6,277.5	0.48	PROPRIETARY BIOFILTRATION	--	177.9	TBD
35	1,080.6	0.08	PROPRIETARY BIOFILTRATION	--	30.6	
36	16,911.6	1.24	BASIN WITH PROPRIETARY BIOFILTRATION	--	460.1	
37	3,415.6	0.26	PROPRIETARY BIOFILTRATION	--	96.8	
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[1] *Based on 1.5' ponding depth.*
[2] *Based on 0.0027 cfs (1.0 gpm) per sf of proprietary media for flow-based BMPs.*
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[4] *Minimum footprint for each BMP will be provided in each DMA. Actual model or footprint to be determined.*

BMP missing for DMA 34? Please clarify.

LEGEND

- PROJECT LIMITS
- NAP — NOT A PART
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- DMA / ACRE — DMA DESIGNATION AND ACRES
- DMA DESIGNATION AND ACRES
- DMA DESIGNATION AND ACRES
- PROJECT STORM DRAIN SYSTEM (PRIVATE)
- EXISTING/OFFSITE STORM DRAIN SYSTEM (PUBLIC)
- PROJECT CATCH BASIN WITH BMP (PRIVATE) S1 STORM DRAIN SYSTEM STENCILING/SIGNAGE
- PROJECT CATCH BASIN WITH BMPS (PRIVATE) S1 STORM DRAIN SYSTEM STENCILING/SIGNAGE BIO-7 PROPRIETARY BIOFILTRATION (BIOTREATMENT)
- EXISTING/OFFSITE CATCH BASIN (PUBLIC)
- WATER QUALITY DIVERSION STRUCTURE (PRIVATE) INCLUDES 2-YEAR STORM FOR WESTERN PROJECT AREA
- BIO-7 PROPRIETARY BIOFILTRATION (PRIVATE)
- BIO-7 BASIN WITH PROPRIETARY BIOFILTRATION MEDIA (PRIVATE)
- BIO-1 BIORETENTION WITH UNDERDRAIN (PRIVATE)
- SUBSURFACE DETENTION FACILITY (PRIVATE)
- DISCHARGE POINT

BIO-1 BIORETENTION WITH UNDERDRAIN & BIO-7 PROPRIETARY BIOTREATMENT (BASIN TYPE)
TYPICAL SECTION DETAIL
N.T.S.

N

GRAPHIC SCALE
0 125 250 500
(IN FEET)
1 INCH = 250 FT.

PRELIMINARY/CONCEPTUAL DRAFT WATER QUALITY MANAGEMENT PLAN - SITE PLAN

APPLICANT:
AERA
3030 SATURN STREET, SUITE 101
BREA, CA 92821
(714) 577-9147

PREPARED BY:
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

"BREA 265"
SOUTH OF LAMBERT ROAD
AND VALENCIA AVENUE
CITY OF BREA, COUNTY OF ORANGE, CALIFORNIA

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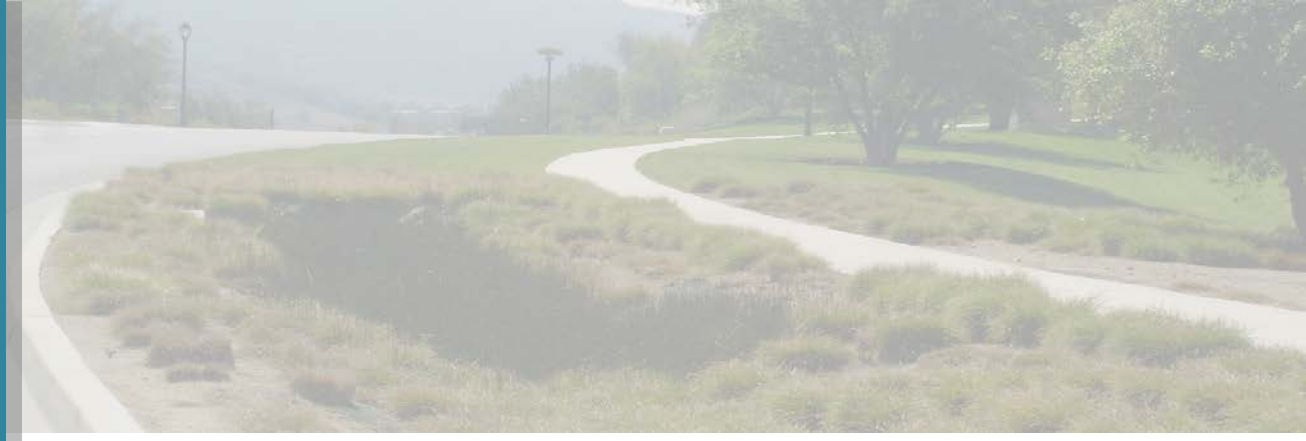
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