County of San Diego
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

Sweetwater Vistas
TM 5608

Sweetwater Springs Blvd and Jamacha Blvd
Spring Valley, CA 91977

ASSESSOR'S PARCEL NUMBER(S):
505-672-03, 07, 09, 10, 23, 37

ENGINEER OF WORK:

Robert A. Chase RCE #41903, Expires 3/31/2018

PREPARED FOR:

Sweetwater Vistas, LLC
1620 Fifth Avenue, Suite 400
San Diego, CA 92101
619.906.4353

PDP SWQMP PREPARED BY:

Fuscoe Engineering
6390 Greenwich Drive, Suite 170
San Diego, CA 92122
858.554.1500

DATE OF SWQMP:
March 30, 2017

PLANS PREPARED BY:
Robert A. Chase, P.E.
6390 Greenwich Drive Suite 170
San Diego, CA 92122
858.554.1500

SWQMP APPROVED BY:

APPROVAL DATE:

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Table of Contents

Attachments

Acronyms

ACP	Alternative Compliance Project
APN	Assessor's Parcel Number
BMP	Best Management Practice
BMP DM	Best Management Practice Design Manual
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDCI	Private Development Construction Inspection Section
PDP	Priority Development Project
PDS	Planning and Development Services
PE	Professional Engineer
RPO	Resource Protection Ordinance
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan
WMAA	Watershed Management Area Analysis
WPO	Watershed Protection Ordinance
WQIP	Water Quality Improvement Plan

PDP SWQMP Preparer's Certification Page

Project Name: Sweetwater Vistas
Permit Application Number: TM 5608

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100) requirements for storm water management.

I have read and understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by County staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

____
Engineer of Work's Signature, PE Number & Expiration Date

Robert A. Chase, RCE #41903 Expiration Date: 03/31/18
Print Name

Fuscoe Engineering Inc.
Company

March 30, 2017
Date

Engineer's Seal:

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Submittal Record

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Preliminary Design / Planning / CEQA

Submittal Number	**Date**	**Summary of Changes**
1	August 10, 2015	Initial Submittal
2	February 12, 2016	Revised to use latest county template
3	November 7, 2016	Revised per County Comments
4	March 10, 2017	Revised per County Comments
5	March 30, 2017	Revised per County Comments

Final Design

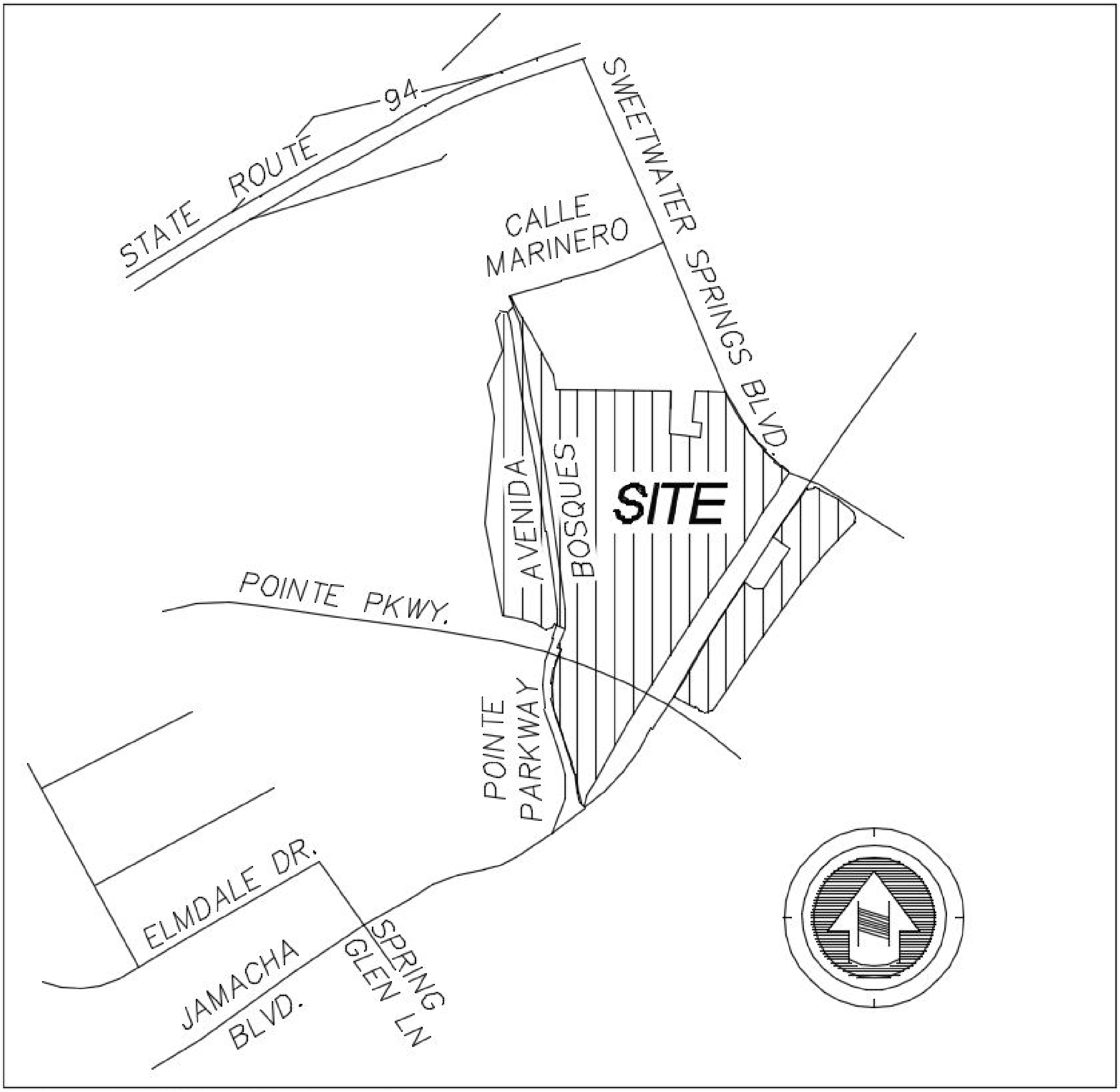
Submittal Number	**Date**	**Summary of Changes**
1		Initial Submittal
2		
3		
4		

Plan Changes

Submittal Number	**Date**	**Summary of Changes**
1		Initial Submittal
2		
3		
4		

Project Vicinity Map

Project Name: Sweetwater Vistas
Record ID: TM-5608



THOMAS BROS PG 1291—E1

VICINITY MAP
NO SCALE

Step 1: Project type determination (Standard or Priority Development Project)

Is the project part of another Priority Development Project (PDP)? If so, a PDP SWQMP is required. Go to Step 2.			(☒ Yes ☐ No
The project is (select one): ☒ New Development ☐ Redevelopment[1]			
The total proposed newly created or replaced impervious area is: ft²			496,289
The total existing (pre-project) impervious area is:			720 ft²
The total area disturbed by the project is:			933,048 ft²
If the total area disturbed by the project is 1 acre (43,560 sq. ft.) or more OR the project is part of a larger common plan of development disturbing 1 acre or more, a Waste Discharger Identification (WDID) number must be obtained from the State Water Resources Control Board. WDID: _To Be Determined__			
Is the project in any of the following categories, (a) through (f)?[2]			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces [3](collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

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[1] Redevelopment is defined as: The creation and/or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include routine maintenance activities, such as trenching and resurfacing associated with utility work; pavement grinding; resurfacing existing roadways; new sidewalks construction; pedestrian ramps; or bike lanes on existing roads; and routine replacement of damaged pavement, such as pothole repair.

[2] Applicants should note that any development project that will create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) is considered a new development.

[3] For solar energy farm projects, the area of the solar panels does not count toward the total impervious area of the site.

Project type determination (continued)

Yes ☒	No ☐	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.*
Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See BMP Design Manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?

☐ No – the project is <u>not</u> a Priority Development Project (Standard Project).
☒ Yes – the project is a Priority Development Project (PDP).

Further guidance may be found in Chapter 1 and Table 1-2 of the BMP Design Manual.

The following is for **redevelopment PDPs only**:

The area of existing (pre-project) impervious area at the project site is: ft^2 (A)
The total proposed newly created or replaced impervious area is ft^2 (B)
Percent impervious surface created or replaced (B/A)*100: %
The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – **only newly created or replaced impervious areas are considered a PDP and subject to stormwater requirements**

OR

☐ greater than fifty percent (50%) – **the entire project site is considered a PDP and subject to stormwater requirements**

Step 1.1: Storm Water Quality Management Plan requirements

Step	Answer	Progression
Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, complete Step 1 Project Type Determination Checklist on Pages 1 and 2, and see PDP exemption information below. For further guidance, see Section 1.4 of the BMP Design Manual *in its entirety*.	☐ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP.**
	☒ PDP	Standard and PDP requirements apply, including PDP SWQMP. **Complete PDP SWQMP.**
	☐ PDP with ACP	If participating in offsite alternative compliance, **complete Step 6.3 and an ACP SWQMP.**
	☐ PDP Exemption	**Go to Step 1.2 below.**

Step 1.2: Exemption to PDP definitions

Is the project exempt from PDP definitions based on either of the following:	If so:
☐ Projects that are only new or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria: (i) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR (ii) Designed and constructed to be hydraulically disconnected from paved streets or roads [i.e., runoff from the new improvement does not drain directly onto paved streets or roads]; OR (iii) Designed and constructed with permeable pavements or surfaces in accordance with County of San Diego Guidance on Green Infrastructure;	Standard Project requirements apply, AND any additional requirements specific to the type of project. County concurrence with the exemption is required. *Provide discussion and list any additional requirements below in this form.* **Complete Standard Project SWQMP**
☐ Projects that are only retrofitting or redeveloping existing paved alleys, streets or roads that are designed and constructed in accordance with the County of San Diego Guidance on Green Infrastructure.	**Complete Green Streets PDP Exempt SWQMP.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:	

Step 2: Construction Storm Water BMP Checklist

Minimum Required Standard Construction Storm Water BMPs		
If you answer "Yes" to any of the questions below, your project is subject to Table 1 on the following page (Minimum Required Standard Construction Stormwater BMPs). As noted in Table 1, please select at least the minimum number of required BMPs, or as many as are feasible for your project. If no BMP is selected, an explanation must be given in the box provided. The following questions are intended to aid in determining construction BMP requirements for your project. **Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.**		
1. Will there be soil disturbing activities that will result in exposed soil areas? (This includes minor grading and trenching.) **Reference Table 1 Items A, B, D, and E** Note: Soil disturbances NOT considered significant include, but are not limited to, change in use, mechanical/electrical/plumbing activities, signs, temporary trailers, interior remodeling, and minor tenant improvement.	☒Yes	☐No
2. Will there be asphalt paving, including patching? **Reference Table 1 Items D and F**	☒Yes	☐No
3. Will there be slurries from mortar mixing, coring, or concrete saw cutting? **Reference Table 1 Items D and F**	☒Yes	☐No
4. Will there be solid wastes from concrete demolition and removal, wall construction, or form work? **Reference Table 1 Items D and F**	☒Yes	☐No
5. Will there be stockpiling (soil, compost, asphalt, concrete, solid waste) for over 24 hours? **Reference Table 1 Items D and F**	☒Yes	☐No
6. Will there be dewatering operations? **Reference Table 1 Items C and D**	☒Yes	☐No
7. Will there be temporary on-site storage of construction materials, including mortar mix, raw landscaping and soil stabilization materials, treated lumber, rebar, and plated metal fencing materials? **Reference Table 1 Items E and F**	☒Yes	☐No
8. Will trash or solid waste product be generated from this project? **Reference Table 1 Item F**	☒Yes	☐No
9. Will construction equipment be stored on site (e.g.: fuels, oils, trucks, etc.?) **Reference Table 1 Item F**	☒Yes	☐No
10. Will Portable Sanitary Services ("Porta-potty") be used on the site? **Reference Table 1 Item F**	☒Yes	☐No

Table 1. Construction Storm Water BMP Checklist

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook[4] Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
A. Select Erosion Control Method for Disturbed Slopes (choose at least one for the appropriate season)			
Vegetation Stabilization Planting[5] (Summer)	SS-2, SS-4	☒	
Hydraulic Stabilization Hydroseeding[2] (Summer)	SS-4	☒	
Bonded Fiber Matrix or Stabilized Fiber Matrix[6] (Winter)	SS-3	☒	
Physical Stabilization Erosion Control Blanket[3] (Winter)	SS-7	☒	
B. Select erosion control method for disturbed flat areas (slope < 5%) (choose at least one)			
County Standard Lot Perimeter Protection Detail	PDS 659[7], SC-2	☒	
Will use erosion control measures from Item A on flat areas also	SS-3, 4, 7	☒	
County Standard Desilting Basin (must treat all site runoff)	PDS 660[8], SC-2	☒	
Mulch, straw, wood chips, soil application	SS-6, SS-8	☒	

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[4] State of California Department of Transportation (Caltrans). 2003. Storm Water Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual. March. Available online at: http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm.

[5] If Vegetation Stabilization (Planting or Hydroseeding) is proposed for erosion control it may be installed between May 1st and August 15th. Slope irrigation is in place and needs to be operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. The owner must implement a contingency physical BMP by August 15th if vegetation establishment does not occur by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.

[6] All slopes over three feet must have established vegetative cover prior to final permit approval.

[7] County of San Diego, Planning & Development Services. 2012. Standard Lot Perimeter Protection Design System. Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds659.pdf.

[8] County of San Diego, Planning & Development Services. 2012. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds660.pdf.

Table 1. Construction Storm Water BMP Checklist (continued)

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
C. If runoff or dewatering operation is concentrated, velocity must be controlled using an energy dissipater			
Energy Dissipater Outlet Protection[9]	SS-10	☒	
D. Select sediment control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☒	
Fiber Rolls (Straw Wattles)	SC-5	☒	
Gravel & Sand Bags	SC-6 & 8	☒	
Dewatering Filtration	NS-2	☒	
Storm Drain Inlet Protection	SC-10	☒	
Engineered Desilting Basin (sized for 10-year flow)	SC-2	☒	
E. Select method for preventing offsite tracking of sediment (choose at least one)			
Stabilized Construction Entrance	TC-1	☒	
Construction Road Stabilization	TC-2	☒	
Entrance/Exit Tire Wash	TC-3	☒	
Entrance/Exit Inspection & Cleaning Facility	TC-1	☒	
Street Sweeping and Vacuuming	SC-7	☒	
F. Select the general site management BMPs			
F.1 Materials Management			
Material Delivery & Storage	WM-1	☒	
Spill Prevention and Control	WM-4	☒	
F.2 Waste Management[10]			
Waste Management Concrete Waste Management	WM-8	☒	
Solid Waste Management	WM-5	☒	
Sanitary Waste Management	WM-9	☒	
Hazardous Waste Management	WM-6	☒	

Note: The Construction General Permit (Order No. 2009-0009-DWQ) also requires all projects not subject to the BMP Design Manual to comply with runoff reduction requirements through the implementation of post-construction BMPs as described in Section XIII of the order.

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[9] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater is also acceptable for velocity reduction.

[10] Not all projects will have every waste identified. The applicant is responsible for identifying wastes that will be onsite and applying the appropriate BMP. For example, if concrete will be used, BMP WM-8 must be selected.

Step 3: County of San Diego PDP SWQMP Site Information Checklist

Step 3.1: Description of Existing Site Condition

Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	909.21 Sweetwater HU, Middle Sweetwater HA, Jamacha HSA

Current Status of the Site (select all that apply):
- ☐ Existing development
- ☐ Previously graded but not built out
- ☐ Demolition completed without new construction
- ☐ Agricultural or other non-impervious use
- ☒ Vacant, undeveloped/natural

Description / Additional Information:

Existing Land Cover Includes (select all that apply and provide each area on site):
- ☒ Vegetative Cover 46.45 Acres (2,023,356 Square Feet)
- ☒ Non-Vegetated Pervious Areas 5.44 Acres (236,375 Square Feet)
- ☒ Impervious Areas 0.02 Acres (720 Square Feet)

Description / Additional Information:

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
- ☐ NRCS Type A
- ☐ NRCS Type B
- ☒ NRCS Type C
- ☒ NRCS Type D

Approximate Depth to Groundwater (GW) (or N/A if no infiltration is used):
- ☐ GW Depth < 5 feet
- ☒ 5 feet < GW Depth < 10 feet
- ☐ 10 feet < GW Depth < 20 feet
- ☐ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

☒ Watercourses
☒ Seeps
☒ Springs
☐ Wetlands
☐ None
☐ Other

Description / Additional Information:

The project has been specifically designed to avoid and minimize impacts to jurisdictional waters and wetlands. The near entirety of jurisdictional resources at the project site will be avoided and preserved, including resources associated with Hansen's Creek and Little Hansen's Creek. Unavoidable impacts are limited to 0.03 acre of non-wetland waters associated with an existing drainage ditch that receives and conveys storm and nuisance flows from an existing storm drain that outfalls into uplands on the site. The 0.03 acre constitute non-wetland waters of the U.S. subject to the regulatory jurisdiction of the U.S. Army Corps of Engineers (USACE) pursuant to Clean Water Act (CWA) Section 404, non-wetland waters of the State subject to the regulatory jurisdiction of the Regional Water Quality Control Board (RWQCB) pursuant to CWA Section 401, and unvegetated streambed subject to the regulatory jurisdiction of the California Department of Fish and Wildlife (CDFW) pursuant to Sections 1600 et seq. of California Fish and Game Code. Impacts would be mitigated on site through re-establishment of a conveyance feature of equivalent or superior function at a 2:1 ratio. The re-established feature would be preserved in perpetuity, along with the remaining avoided waters and wetlands on the site.

Step 3.2: Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

(1) Whether existing drainage conveyance is natural or urban;
(2) Is runoff from offsite conveyed through the site? if yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site;
(3) Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels; and
(4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Describe existing site drainage patterns:

The existing site consists of one main basin, which is divided into two sub-basins. Runoff from the sub-basin A1 drains into a large existing detention basin located north of the intersection of Jamacha Boulevard and Pointe Parkway. Runoff from multiple residences adjacent to the project site discharges onto the property which conveys into a natural flow path and is picked up by an existing 84” RCP storm drain that extends below Jamacha Blvd.

Sub-basin A2 collects runoff from Sweetwater Springs Blvd, Jamacha Blvd and Pointe Parkway which confluences at the intersection of Jamacha Blvd and Pointe Parkway, where the runoff discharges into the same existing 84” RCP storm drain system along Jamacha Blvd.

Sub-Basin A1

	A (Acre)	Tc (Min.)	Q (CFS)
Existing	47.0	17.4	576
Proposed	49.6	17.4	576
Change	+2.6	0	0

Sub-Basin A2

	A (Acre)	Tc (Min.)	Q (CFS)
Existing	11.2	11.1	31
Proposed	8.8	11.5	31
Change	-2.4	+0.4	0

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

The Sweetwater Vistas project consists of approximately 52.0 acres and is located in the unincorporated area of Spring Valley. Approximately 43.5 acres of the project are located at the northwest corner of Jamacha Boulevard and Sweetwater Springs Boulevard (the "Western Parcel"). Approximately 8.5 acres of the project are located at the southeast corner of Jamacha Boulevard and Sweetwater Springs Boulevard, directly west of the Otay Water District offices (the "Eastern Parcel"). These sites are bisected by Jamacha Boulevard. The project proposes the development of a new master planned community consisting of 218 multi-family residential units on three pads and the extension of Avenida Bosques, all in the Western Parcel. Approximately 25.9 acres of the total project will be proposed for reservation as biological open space, including the 8.5 acres of the "Eastern Parcel".

Proposed Community Plan Land Use consists of Village Residential and Open Space.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

The proposed development will include 218 multi-family residential units, access roads, parking areas, sidewalks, and utilities for a master planned community.

List/describe proposed pervious features of the project (e.g., landscape areas):

The proposed development will include landscaped areas, vegetated swale/bio filters, and a significant amount of natural open space.

Does the project include grading and changes to site topography?

☒Yes
☐No

Description / Additional Information:

The proposed project will construct three graded lots proposed for condominium purposes and will not disturb the wetland area that bisects the western parcel.

Insert acreage or square feet for the different land cover types in the table below:

Change in Land Cover Type Summary

Land Cover Type	Existing (acres or ft^2)	Proposed (acres or ft^2)	Percent Change
Vegetation	2,023,356 ft^2	1,701,977 ft^2	-16%
Pervious (non-vegetated)	236,375 ft^2	62,185 ft^2	-74%
Impervious	720 ft^2	496,289 ft^2	+68929 %

Step 3.4: Description of Proposed Site Drainage Patterns

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒Yes
☐No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns:

The site receives run-on from multiple adjacent parcels. The outlet locations of the adjacent parcels are at the following streets: Avenida Bosques, California Waters Drive, Foothill Court and Fabled Waters Court. The runoff from these streets convey into a natural flow path that drains into a large existing detention basin, which is then picked up by an existing 84” storm drain.

The proposed design consists of a duel system, which is made up of a bypass storm drain that is not treated and a second storm drain system to be treated within the bio-filtration basins. The runoff from the adjacent parcels is being directed into the bypass storm drain system that extends along the proposed road (Avenida Bosques extension) and outlets into the large existing detention basin. The second storm drain system picks up runoff from the proposed road and lot 2, then is treated by the bio-filtration basin and outflows across the natural terrain into the large existing detention basin. Lots 1 and 3 are also treated by bio-filtration basins and convey into a natural flow path. All natural flow paths lead into the large existing detention basin, where it is then discharged through the existing 84” storm drain system that extends below Jamacha Blvd.

It is the intent of the new design to detain and treat runoff from the project and provide a new low flow outlet from the basin to drawdown the stored water. To accomplish this, the portion of the site draining to the basin was delineated into a Drainage Management Area (DMA), and the hydromodification mitigation facility is designed to reduce flows from this DMA to non-erosive levels.

Step 3.5: Potential Pollutant Source Areas

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply). Select "Other" if the project is a phased development and provide a description:

☒ On-site storm drain inlets
☒ Interior floor drains and elevator shaft sump pumps
☐ Interior parking garages
☒ Need for future indoor & structural pest control
☒ Landscape/Outdoor Pesticide Use
☒ Pools, spas, ponds, decorative fountains, and other water features
☐ Food service
☒ Refuse areas
☐ Industrial processes
☒ Outdoor storage of equipment or materials
☐ Vehicle and Equipment Cleaning
☐ Vehicle/Equipment Repair and Maintenance
☐ Fuel Dispensing Areas
☐ Loading Docks
☒ Fire Sprinkler Test Water
☒ Miscellaneous Drain or Wash Water
☒ Plazas, sidewalks, and parking lots
☐ Other (provide description)

Description / Additional Information:

Step 3.6: Identification and Narrative of Receiving Water and Pollutants of Concern

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):

All natural flow paths lead into the large existing detention basin at the southern end of the project. From there, runoff enters an existing 84" storm drain system in Jamacha Blvd. Approximately 1,000 ft south of the project the storm drain discharges to a creek on the east side of Jamacha Blvd. That creek lies immediately adjacent to Jamacha Blvd and eventually confluences with the Sweetwater River approximately 5,000 ft north of Sweetwater Reservoir. Downstream of the reservoir, Sweetwater River flows westerly through Bonita Golf Club, Chula Vista Golf Course, Rohr Park, alongside Plaza Bonita and then on to Sweetwater Channel and the San Diego Bay.

List any 303(d) impaired water bodies[11] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	**Pollutant(s)/Stressor(s)**	**TMDLs / WQIP Highest Priority Pollutant**
Sweetwater Reservoir 909.21	Dissolved Oxygen	2.15 miles

Identification of Project Site Pollutants*

*Identification of project site pollutants below is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs. Note the project must also participate in an alternative compliance program (unless prior lawful approval to meet earlier PDP requirements is demonstrated).

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6):

Pollutant	**Not Applicable to the Project Site**	**Anticipated from the Project Site**	**Also a Receiving Water Pollutant of Concern**
Sediment	☐	☒	☐
Nutrients	☐	☒	☐
Heavy Metals	☐	☒	☐
Organic Compounds	☐	☒	☐
Trash & Debris	☐	☒	☐
Oxygen Demanding Substances	☐	☒	☐

---

[11] The current list of Section 303(d) impaired water bodies can be found at http://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/#impaired

Oil & Grease	☐	☒	☐
Bacteria & Viruses	☐	☒	☐
Pesticides	☐	☒	☐

Step 3.7: Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

☒Yes, hydromodification management requirements for flow control and preservation of critical coarse sediment yield areas are applicable.

☐No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA[12] for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

---

[12] The Watershed Management Area Analysis (WMAA) is an optional element for inclusion in the Water Quality Improvement Plans (WQIPs) described in the 2013 MS4 Permit [Provision B.3.b.(4)]. It is available online at the Project Clean Water website: http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=248

Step 3.7.1: Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

Projects must satisfy critical coarse sediment yield area (CCSYA) requirements by characterizing the project as one of the scenario-types presented below and satisfying associated criteria. Projects must appropriately satisfy all requirements for identification, avoidance, and bypass, OR may alternatively elect to demonstrate no net impact.

☒ **Scenario 1**: Project is subject to and in compliance with RPO requirements *(without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3) that result in impacts to more than 15% of the project-scale CCSYAs)*.

- ☒ Identify: Project has identified both onsite and upstream CCSYAs as areas that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,*
- ☒ Avoid: Project has avoided onsite CCSYAs per existing RPO steep slope encroachment criteria. AND,
- ☒ Bypass: Project has demonstrated that both onsite and upstream CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR,
- ☐ No Net Impact: Project does not satisfy all Scenario 1 criteria above and must alternatively demonstrate no net impact to the receiving water.

☐ **Scenario 2**: Project is entirely exempt/not subject to RPO requirements without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3).

- ☐ Identify: Project has identified upstream CCSYAs that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,*
- ☐ Avoid: Project is not required to avoid onsite CCSYAs as none were identified in the previous step. AND,
- ☐ Bypass: Project has demonstrated that upstream CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR,
- ☐ No Net Impact: Project does not satisfy all Scenario 2 criteria above and must alternatively demonstrate no net impact to the receiving water. *(Skip to next row).*

☐ **Scenario 3**: Project utilizes exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3) and impacts more than 15% of the project-scale CCSYAs.

- ☐ No Net Impact: Project is not eligible for traditional methods of identification, avoidance, and bypass. Project must demonstrate no net impact to the receiving water.

Critical Coarse Sediment Yield Areas Continued

Demonstrate No Net Impact

If the project elects to satisfy CCSYA criteria through demonstration of no net impact to the receiving water. Applicants must identify the methods utilized from the list below and provide supporting documentation in Attachment 2c of the SWQMP. Check all that are applicable.

☒ N/A, the project appropriately identifies, avoids, and bypasses CCSYAs.
☐ Project has performed additional analysis to demonstrate that impacts to CCSYAs satisfy the no net impact standard of Ep/Sp≤1.1.
☐ Project has provided alternate mapping of CCSYAs.
☐ Project has implemented additional onsite hydromodification flow control measures.
☐ Project has implemented an offsite stream rehabilitation project to offset impacts.
☐ Project has implemented other applicant-proposed mitigation measures.

Step 3.7.2: Flow Control for Post-Project Runoff*

***This Section only required if hydromodification management requirements apply**

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

POC 1
POC 2
POC3

Has a geomorphic assessment been performed for the receiving channel(s)?
☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)
☐ Yes, the result is the low flow threshold is 0.1Q2
☐ Yes, the result is the low flow threshold is 0.3Q2
☐ Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Step 3.8: Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

There were several factors that limited the ability to place biofiltration facilities. With the natural drainage course being at the bottom of a canyon, the ability to provide driveable access to the biofiltration basins became a challenge. In addition, much of the lower elevations were to be preserved as biological open space. With these two constraints in mind the biofiltration basins were placed near the edges of the three pads but at slightly lower elevations. Walls were often required to be able to achieve the surface area needed for water quality treatment while also being able to keep the graded footprint out of the proposed open space. In addition to those two factors, there is an existing sewer main that crosses the site and had to be kept away from.

Optional Additional Information or Continuation of Previous Sections As Needed

This space provided for additional information or continuation of information from previous sections as needed.

Step 4: Source Control BMP Checklist

Source Control BMPs

All development projects must implement source control BMPs 4.2.1 through 4.2.6 where applicable and feasible. See Chapter 4.2 and Appendix E of the County BMP Design Manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following:

- "Yes" means the project will implement the source control BMP as described in Chapter 4.2 and/or Appendix E of the County BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification must be provided.

Source Control Requirement	**Applied?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.3 not implemented:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.4 not implemented:			

Source Control Requirement	**Applied?**		
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.5 not implemented:			
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☒ A. On-site storm drain inlets	☒Yes	☐No	☐N/A
☒ B. Interior floor drains and elevator shaft sump pumps	☒Yes	☐No	☐N/A
☐ C. Interior parking garages	☐Yes	☐No	☐N/A
☒ D. Need for future indoor & structural pest control	☒Yes	☐No	☐N/A
☒ E. Landscape/outdoor pesticide use	☒Yes	☐No	☐N/A
☒ F. Pools, spas, ponds, fountains, and other water features	☒Yes	☐No	☐N/A
☐ G. Food service	☐Yes	☐No	☐N/A
☒ H. Refuse areas	☒Yes	☐No	☐N/A
☐ I. Industrial processes	☐Yes	☐No	☐N/A
☒ J. Outdoor storage of equipment or materials	☒Yes	☐No	☐N/A
☐ K. Vehicle and equipment cleaning	☐Yes	☐No	☐N/A
☐ L. Vehicle/equipment repair and maintenance	☐Yes	☐No	☐N/A
☐ M. Fuel dispensing areas	☐Yes	☐No	☐N/A
☐ N. Loading docks	☐Yes	☐No	☐N/A
☒ O. Fire sprinkler test water	☒Yes	☐No	☐N/A
☒ P. Miscellaneous drain or wash water	☒Yes	☐No	☐N/A
☒ Q. Plazas, sidewalks, and parking lots	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Note: Show all source control measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 5: Site Design BMP Checklist

Site Design BMPs
All development projects must implement site design BMPs SD-A through SD-H where applicable and feasible. See Chapter 4.3 and Appendix E of the County BMP Design Manual for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the site design BMP as described in Chapter 4.3 and/or Appendix E of the County BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification must be provided.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.1 not implemented:			
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.2 not implemented:			
4.3.3 Minimize Impervious Area	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.5 not implemented: The site has been designed to ensure rooftop runoff and other impervious areas are directed to pervious areas for treatment before discharging from site.			

<table>
<tr><th>Site Design Requirement</th><th colspan="3">Applied?</th></tr>
<tr><td>4.3.6 Runoff Collection</td><td>☒Yes</td><td>☐No</td><td>☐N/A</td></tr>
<tr><td colspan="4"><i>Discussion / justification if 4.3.6 not implemented:</i>
Runoff travels to small collection locations such as landscaped areas to minimize the transport of runoff and pollutants to the MS4 and receiving waters.</td></tr>
<tr><td>4.3.7 Landscaping with Native or Drought Tolerant Species</td><td>☒Yes</td><td>☐No</td><td>☐N/A</td></tr>
<tr><td colspan="4"><i>Discussion / justification if 4.3.7 not implemented:</i></td></tr>
<tr><td>4.3.8 Harvesting and Using Precipitation</td><td>☐Yes</td><td>☒No</td><td>☐N/A</td></tr>
<tr><td colspan="4"><i>Discussion / justification if 4.3.8 not implemented:</i>
Harvest and reuse considered to be infeasible for this project see Attachment 1b for calculations.</td></tr>
</table>

Note: Show all site design measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 6: PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the County at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the County must confirm the maintenance (see Section 7 of the BMP Design Manual).

Use this section to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (Step 6.2) for each structural BMP within the project (copy the BMP summary information sheet [Step 6.2] as many times as needed to provide summary information for each individual structural BMP).

Step 6.1: Description of structural BMP strategy

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate. At the end of this discussion provide a summary of all the structural BMPs within the project including the type and number.

Biofiltration basins were chosen as the treatment control BMP due to the medium to high removal rate for pollutants associated with residential projects. The biofiltration basins were sized per the County's BMP Sizing Spreadsheet V1.04. DMAs 1.1, 1.2, 1.3, 2, 3 and 4 will utilize cisterns to account for hydromodification management requirements. A separate Hydromodification Management Plan was prepared for this project. DMA 7 uses tree wells to treat runoff from the widening of Sweetwater Springs Boulevard. The number of tree wells was determined by using Worksheet B.1-1 (V1-3)

Rain harvest and use has been evaluated and deemed infeasible. See Appendix 1.b for Feasibility analysis of rain harvest and reuse and Summary of BMP Feasibility Analysis.

(Continue on following page as necessary.)

Description of structural BMP strategy continued **(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)**
(Continued from previous page)

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration Basin 1 (with Cistern) (Parallel System)

Construction Plan Sheet No. To Be Determined

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or [✓ vault] for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	Robert A. Chase, P.E. Fuscoe Engineering, Inc. 6390 Greenwich Drive. Suite 170 San Diego, CA 92122
Who will be the final owner of this BMP?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	2

Discussion (as needed):

(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration Basin 2 (with Cistern) (Parallel System)

Construction Plan Sheet No. To Be Determined

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or [✓ vault] for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	Robert A. Chase, P.E. Fuscoe Engineering, Inc. 6390 Greenwich Drive. Suite 170 San Diego, CA 92122
Who will be the final owner of this BMP?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	2

Discussion (as needed):

(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration Basin 3 (with Cistern) (Parallel System)

Construction Plan Sheet No. To Be Determined

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or [✓ vault] for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	Robert A. Chase, P.E. Fuscoe Engineering, Inc. 6390 Greenwich Drive. Suite 170 San Diego, CA 92122
Who will be the final owner of this BMP?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	2

Discussion (as needed):

(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. Biofiltration Basin 4 (with Cistern) (Parallel System)

Construction Plan Sheet No. To Be Determined

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)
☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or [✓ vault] for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	Robert A. Chase, P.E. Fuscoe Engineering, Inc. 6390 Greenwich Drive. Suite 170 San Diego, CA 92122
Who will be the final owner of this BMP?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☒ HOA ☐ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	2

Discussion (as needed):

(Continue on subsequent pages as necessary)

Step 6.3: Offsite Alternative Compliance Participation Form

PDP INFORMATION	
Record ID:	N/A
Assessor's Parcel Number(s) [APN(s)]	N/A
What are your PDP Pollutant Control Debits? *See Attachment 1 of the PDP SWQMP	N/A
What are your PDP HMP Debits? (if applicable) *See Attachment 2 of the PDP SWQMP	N/A
ACP Information	
Record ID:	N/A
Assessor's Parcel Number(s) [APN(s)]	N/A
Project Owner/Address	N/A
What are your ACP Pollutant Control Credits? *See Attachment 1 of the ACP SWQMP	N/A
What are your ACP HMP Debits? (if applicable) *See Attachment 2 of the ACP SWQMP	N/A
Is your ACP in the same watershed as your PDP? ☐ Yes ☐ No	Will your ACP project be completed prior to the completion of the PDP? ☐ Yes ☐ No
Does your ACP account for all Deficits generated by the PDP? ☐ Yes ☐ No (PDP and/or ACP must be redesigned to account for all deficits generated by the PDP.	What is the difference between your PDP debits and ACP Credits? *(ACP Credits -Total PDP Debits = Total Earned Credits)

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	Storm Water Pollutant Control Worksheet Calculations -Worksheet B.3-1 (Required) -Worksheet B.1-1 (Required) -Worksheet B.4-1 (if applicable) -Worksheet B.4-2 (if applicable) -Worksheet B.5-1 (if applicable) -Worksheet B.5-2 (if applicable) -Worksheet B.5-3 (if applicable) -Worksheet B.6-1 (if applicable) -Summary Worksheet (optional)	☒ Included
Attachment 1b	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1c	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ Included
Attachment 1d	Individual Structural BMP DMA Mapbook (Required) -Place each map on 8.5”x11” paper. -Show at a minimum the DMA, Structural BMP, and any existing hydrologic features within the DMA.	☒ Included

County of San Diego Automated Stormwater Pollutant Control Worksheets
(Version 1.3)

WELCOME:

Welcome to the County of San Diego Automated Stormwater Pollutant Control Worksheets. Priority Development Projects that are required to satisfy stormwater pollutant control performance standards set forth in the 2013 MS4 Permit may use these automated worksheets to calculate design capture volumes and determine what portion of pollutant control performance standards are satisfied by their project.

INSTRUCTIONS:

General: To use this workbook users must navigate to the appropriate worksheet tabs and populate yellow cells with project specific information. These worksheet tabs are formatted to accommodate calculations for up to 10 drainage areas and associated BMPs. Each drainage area and/or BMP is represented as a discrete column with corresponding user inputs and calculations appearing in the rows below. Please note that projects with more than 10 drainage areas may need to use more than one workbook to accommodate their entire project. Yellow cells represent items that require user input, white cells are locked for editing and are automatically calculated, blue cells are also locked for editing and are automatically populated based on results from previous worksheet tabs, grey cells represent items that typically require user input but may be omitted based on a previous user input, orange cells represent warnings where supplemental information and/or revisions may be required for compliance, and red cells represent errors associated with proposed stormwater pollutant control measures that negatively affect compliance.

Step 1. Navigate to the orange tab at the bottom of the workbook and provide required inputs to determine the structural BMP types that are acceptable for implementation at the project site.

Step 2. Navigate to the blue tab at the bottom of the workbook and provide the required inputs to determine the design capture volume for each PDP drainage area and identify what type of BMP this area drains to. The calculations in this worksheet determine the initial design capture volume and also apply any applicable reductions associated with site design techniques including dispersion to pervious surfaces, incorporation of tree wells, and incorporation of rain barrels. Upon completion of Step 2, applicants must proceed to Step 3 to ensure that appropriate stormwater pollutant control measures are applied to this volume.

Step 3. Examine the green tabs at the bottom of the workbook and identify which of these BMP types are implemented by the PDP. Click the green tab for each of the proposed BMP types and provide the required user inputs to determine the portion of the pollutant control performance standards that are satisfied by the proposed BMP. After providing appropriate inputs users should verify that no red error messages appear at the bottom of their worksheets and, if necessary, refine user inputs until satisfied with the proposed stormwater pollutant control approach. Once satisfied, applicants must proceed to Step 4 to facilitate their project submittal. Note: Users must ensure that all provided inputs are adequately represented in the accompanying stormwater management plans.

Step 4. Navigate to the purple "Summary" tab at the bottom of this workbook and examine the sheet for warning messages highlighted in red text at the bottom of the worksheet. Once satisfied with the overall results, print the summary sheet and all applicable supporting worksheets in color, 11x17 landscape format and include in Attachment 1a of the SWQMP submittal.

DISCLAIMER:

The County of San Diego has developed this tool in an effort to streamline traditionally complex efforts associated with planning, design, submittal, and review of PDPs that are subject to stormwater pollutant control requirements set forth in the 2013 MS4 Permit. While the calculations performed herein are deemed to be in compliance with Permit requirements, applicants may elect to provide their own calculations. Use of this tool is optional and the County will not be held liable for any errors or other negative impacts associated with its use. In the event that the County performs updates to these worksheets, applicants that have not established reliance on previous versions of the worksheet via discretionary approval may be required to utilize the latest version of the worksheets. A summary of version releases is included below.

QUESTIONS:

-Questions relating to specific projects, submittal requirements, approval process, and/or policy-related issues should be directed your PDS Land Development Project Manager (link below).

PDS Land Development Project Manager

-General questions/comments on this worksheet may be directed to Charles Mohrlock in the County of San Diego Watershed Protection Program (link below).

charles.mohrlock@sdcounty.ca.gov

Automated Worksheet B.3-1: Project-Scale BMP Feasibility Analysis (V1.3)

Category	#	Description	Value	Units
Capture & Use Inputs	0	Design Capture Volume for Entire Project Site	20,466	cubic-feet
	1	Proposed Development Type	Residential	unitless
	2	Number of Residents or Employees at Proposed Development	545	#
	3	Total Planted Area within Development	452,836	sq-ft
	4	Water Use Category for Proposed Planted Areas	Moderate	unitless
Infiltration Inputs	5	Is Average Site Design Infiltration Rate ≤0.500 Inches per Hour?	Yes	yes/no
	6	Is Average Site Design Infiltration Rate ≤0.010 Inches per Hour?	Yes	yes/no
	7	Is Infiltration of the Full DCV Anticipated to Produce Negative Impacts?	Yes	yes/no
	8	Is Infiltration of Any Volume Anticipated to Produce Negative Impacts?	Yes	yes/no
Calculations	9	36-Hour Toilet Use Per Resident or Employee	1.86	cubic-feet
	10	Subtotal: Anticipated 36 Hour Toilet Use	1,016	cubic-feet
	11	Anticipated 1 Acre Landscape Use Over 36 Hours	196.52	cubic-feet
	12	Subtotal: Anticipated Landscape Use Over 36 Hours	2,043	cubic-feet
	13	Total Anticipated Use Over 36 Hours	3,059	cubic-feet
	14	Total Anticipated Use / Design Capture Volume	0.15	cubic-feet
	15	Are Full Capture and Use Techniques Feasible for this Project?	No	unitless
	16	Is Full Retention Feasible for this Project?	No	yes/no
	17	Is Partial Retention Feasible for this Project?	No	yes/no
Result	18	Feasibility Category	5	1, 2, 3, 4, 5

Worksheet B.3-1 General Notes:

A. Applicants may use this worksheet to determine the types of structural BMPs that are acceptable for implementation at their project site (as required in Section 5 of the BMPDM). User input should be provided for yellow shaded cells, values for all other cells will be automatically generated. Projects demonstrating feasibility or potential feasibility via this worksheet are encouraged to incorporate capture and use features in their project.

B. Negative impacts associated with retention may include geotechnical, groundwater, water balance, or other issues identified by a geotechnical engineer and substantiated through completion of Form I-8.

C. Feasibility Category 1: Applicant must implement capture & use, retention, and/or infiltration elements for the entire DCV.

D. Feasibility Category 2: Applicant must implement capture & use elements for the entire DCV.

E. Feasibility Category 3: Applicant must implement retention and/or infiltration elements for all DMAs with Design Infiltration Rates greater than 0.50 in/hr.

F. Feasibility Category 4: Applicant must implement standard unlined biofiltration BMPs sized at ≥3% of the effective impervious tributary area for all DMAs with Design Infiltration Rates of 0.011 to 0.50 in/hr. Applicants may be permitted to implement lined BMPs, reduced size BMPs, and/or specialized biofiltration BMPs provided additional criteria identified in "Supplemental Retention Criteria for Non-Standard Biofiltration BMPs" are satisfied.

G. Feasibility Category 5: Applicant must implement standard lined biofiltration BMPs sized at ≥3% of the effective impervious tributary area for all DMAs with Design Infiltration Rates of 0.010 in/hr or less. Applicants may also be permitted to implement reduced size and/or specialized biofiltration BMPs provided additional criteria identified in "Supplemental Retention Criteria for Non-Standard Biofiltration BMPs" are satisfied.

H. PDPs participating in an offsite alternative compliance program are not held to the feasibility categories presented herein.

Automated Worksheet B.1-1: Calculation of Design Capture Volume (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	0	Drainage Basin ID or Name	1.1	1.2	1.3	2	3	4	7				unitless
	1	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration				unitless
	2	85th Percentile 24-hr Storm Depth	0.51	0.51	0.51	0.51	0.51	0.51	0.51				inches
	3	Design Infiltration Rate Recommended by Geotechnical Engineer											in/hr
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	39,019	68,135	60,480	82,649	161,533	80,397					sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	11,896	23,970	25,055	59,491	59,022	76,818	6,615				sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	11	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	Yes	No	No	No	yes/no
	12	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)							10,658				sq-ft
	13	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	14	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	16	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	17	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	18	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	19	Number of Tree Wells Proposed per SD-A							8				#
	20	Average Mature Tree Canopy Diameter							12				ft
	21	Number of Rain Barrels Proposed per SD-E							0				#
	22	Average Rain Barrel Size											gal
Treatment Train Inputs & Calculations	23	Does BMP Overflow to Stormwater Features in Downstream Drainage?	No	No	No	No	No	No	No	No	No	No	unitless
	24	Identify Downstream Drainage Basin Providing Treatment in Series											unitless
	25	Percent of Upstream Flows Directed to Downstream Dispersion Areas											percent
	26	Upstream Impervious Surfaces Directed to Dispersion Area (Ci=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
	27	Upstream Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
Initial Runoff Factor Calculation	28	Total Tributary Area	50,915	92,105	85,535	142,140	220,555	157,215	17,273	0	0	0	sq-ft
	29	Initial Runoff Factor for Standard Drainage Areas	0.71	0.69	0.67	0.57	0.69	0.51	0.10	0.00	0.00	0.00	unitless
	30	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	unitless
	31	Initial Weighted Runoff Factor	0.71	0.69	0.67	0.57	0.69	0.51	0.59	0.00	0.00	0.00	unitless
	32	Initial Design Capture Volume	1,536	2,701	2,436	3,443	6,468	3,408	433	0	0	0	cubic-feet
Dispersion Area Adjustments	33	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	10,658	0	0	0	sq-ft
	34	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	35	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	36	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	37	Runoff Factor After Dispersion Techniques	0.71	0.69	0.67	0.57	0.69	0.51	0.59	n/a	n/a	n/a	unitless
	38	Design Capture Volume After Dispersion Techniques	1,536	2,701	2,436	3,443	6,468	3,408	433	0	0	0	cubic-feet
Tree & Barrel Adjustments	39	Total Tree Well Volume Reduction	0	0	0	0	0	0	512	0	0	0	cubic-feet
	40	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	41	Final Adjusted Runoff Factor	0.71	0.69	0.67	0.57	0.69	0.51	0.00	0.00	0.00	0.00	unitless
	42	Final Effective Tributary Area	36,150	63,552	57,308	81,020	152,183	80,180	0	0	0	0	sq-ft
	43	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	512	0	0	0	cubic-feet
	44	Final Design Capture Volume Tributary to BMP	1,536	2,701	2,436	3,443	6,468	3,408	0	0	0	0	cubic-feet

Worksheet B.1-1 General Notes:

A. Applicants may use this worksheet to calculate design capture volumes for up to 10 drainage areas User input must be provided for yellow shaded cells, values for all other cells will be automatically generated, errors/notifications will be highlighted in red and summarized below. Upon completion of this worksheet, proceed to the appropriate BMP Sizing worksheet(s).

Automated Worksheet B.5-1: Sizing Lined or Unlined Biofiltration BMPs (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	0	Drainage Basin ID or Name	1.1	1.2	1.3	2	3	4	7	-	-	-	sq-ft
	1	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	in/hr
	2	Effective Tributary Area	36,150	63,552	57,308	81,020	152,183	80,180	0	-	-	-	sq-ft
	3	Minimum Biofiltration Footprint Sizing Factor	0.030	0.030	0.030	0.030	0.030	0.030	0.030	-	-	-	ratio
	4	Design Capture Volume Tributary to BMP	1,536	2,701	2,436	3,443	6,468	3,408	0	-	-	-	cubic-feet
	5	Is Biofiltration Basin Impermeably Lined or Unlined?	Lined	Lined	Lined	Lined	Lined	Lined	Lined				unitless
	6	Provided Biofiltration BMP Surface Area	1,085	1,907	1,720	2,797	6,000	4,000	650				sq-ft
	7	Provided Surface Ponding Depth	12	12	12	12	12	12	12				inches
	8	Provided Soil Media Thickness	18	18	18	18	18	18	18				inches
	9	Provided Depth of Gravel Above Underdrain Invert	18	18	18	12	186	198	12				inches
	10	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.60	0.70	0.80	1.00	0.90	0.90	0.60				inches
	11	Provided Depth of Gravel Below the Underdrain	3	3	3	3	3	3	3				inches
Retention Calculations	12	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	13	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	14	Gravel Pore Space Available for Retention	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	15	Effective Retention Depth	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.00	0.00	0.00	inches
	16	Calculated Retention Storage Drawdown (Including 6 Hr Storm)	120	120	120	120	120	120	120	0	0	0	hours
	17	Volume Retained by BMP	81	143	129	210	450	300	49	0	0	0	cubic-feet
	18	Fraction of DCV Retained	0.05	0.05	0.05	0.06	0.07	0.09	0.00	0.00	0.00	0.00	ratio
	19	Portion of Retention Performance Standard Satisfied	0.06	0.06	0.06	0.07	0.08	0.11	0.00	0.00	0.00	0.00	ratio
	20	Fraction of DCV Retained (normalized to 36-hr drawdown)	0.03	0.03	0.03	0.03	0.04	0.05	0.00	0.00	0.00	0.00	ratio
	21	Design Capture Volume Remaining for Biofiltration	1,490	2,620	2,363	3,340	6,209	3,238	0	0	0	0	cubic-feet
Biofiltration Calculations	22	Max Hydromod Flow Rate through Underdrain	0.0188	0.0256	0.0335	0.0488	0.0902	0.0926	0.0176	n/a	n/a	n/a	CFS
	23	Max Soil Filtration Rate Allowed by Underdrain Orifice	0.75	0.58	0.84	0.75	0.65	1.00	1.17	n/a	n/a	n/a	in/hr
	24	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	25	Soil Media Filtration Rate to be used for Sizing	0.75	0.58	0.84	0.75	0.65	1.00	1.17	5.00	5.00	5.00	in/hr
	26	Depth Biofiltered Over 6 Hour Storm	4.50	3.49	5.04	4.53	3.89	6.00	7.03	30.00	30.00	30.00	inches
	27	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	28	Effective Depth of Biofiltration Storage	22.80	22.80	22.80	20.40	90.00	94.80	20.40	0.00	0.00	0.00	inches
	29	Drawdown Time for Surface Ponding	16	21	14	16	18	12	10	0	0	0	hours
	30	Drawdown Time for Effective Biofiltration Depth	30	39	27	27	139	95	17	0	0	0	hours
	31	Total Depth Biofiltered	27.30	26.29	27.84	24.93	93.89	100.80	27.43	30.00	30.00	30.00	inches
	32	Option 1 - Biofilter 1.50 DCV: Target Volume	2,235	3,930	3,545	5,010	9,314	4,857	0	0	0	0	cubic-feet
	33	Option 1 - Provided Biofiltration Volume	2,235	3,930	3,545	5,010	9,314	4,857	0	0	0	0	cubic-feet
	34	Option 2 - Store 0.75 DCV: Target Volume	1,118	1,965	1,772	2,505	4,657	2,429	0	0	0	0	cubic-feet
	35	Option 2 - Provided Storage Volume	1,118	1,965	1,772	2,505	4,657	2,429	0	0	0	0	cubic-feet
	36	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	ratio
Result	37	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	-	yes/no
	38	Overall Portion of Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	ratio
	39	This BMP Overflows to the Following Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	40	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**0**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.5-1 General Notes:

A. Applicants may use this worksheet to size Lined or Unlined Biofiltration BMPs (BF-1, PR-1) for up to 10 basins. User input must be provided for yellow shaded cells, values for blue cells are automatically populated based on user inputs from previous worksheets, values for all other cells will be automatically generated, errors/notifications will be highlighted in red/orange and summarized below. BMPs fully satisfying the pollutant control performance standards will have a deficit treated volume of zero and be highlighted in green.

Summary of Stormwater Pollutant Control Calculations (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
General Info	0	Drainage Basin ID or Name	1.1	1.2	1.3	2	3	4	7	-	-	-	unitless
	1	85th Percentile Storm Depth	0.51	0.51	0.51	0.51	0.51	0.51	0.51	-	-	-	inches
	2	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	in/hr
	3	Total Tributary Area	50,915	92,105	85,535	142,140	220,555	157,215	17,273	-	-	-	sq-ft
	4	85th Percentile Storm Volume (Rainfall Volume)	2,164	3,914	3,635	6,041	9,374	6,682	734	-	-	-	cubic-feet
Initial DCV	5	Initial Weighted Runoff Factor	0.71	0.69	0.67	0.57	0.69	0.51	0.59	-	-	-	unitless
	6	Initial Design Capture Volume	1,536	2,701	2,436	3,443	6,468	3,408	433	-	-	-	cubic-feet
Site Design Volume Reductions	7	Dispersion Area Reductions	0	0	0	0	0	0	0	-	-	-	cubic-feet
	8	Tree Well and Rain Barrel Reductions	0	0	0	0	0	0	512	-	-	-	cubic-feet
BMP Volume Reductions	9	Effective Area Tributary to BMP	36,150	63,552	57,308	81,020	152,183	80,180	0	-	-	-	square feet
	10	Final Design Capture Volume Tributary to BMP	1,536	2,701	2,436	3,443	6,468	3,408	0	-	-	-	cubic-feet
	11	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	-	-	-	unitless
	12	Volume Retained by BMP (normalized to 36 hour drawdown)	46	81	73	103	259	170	0	-	-	-	cubic-feet
Total Volume Reductions	13	Total Fraction of Initial DCV Retained within DMA	0.03	0.03	0.03	0.03	0.04	0.05	1.18	-	-	-	fraction
	14	Percent of Average Annual Runoff Retention Provided	4.6%	4.6%	4.6%	4.6%	6.1%	7.6%	85.2%	-	-	-	%
	15	Percent of Average Annual Runoff Retention Required	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	-	-	-	%
Performance Standard	16	Percent of Pollution Control Standard Satisfied	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	-	-	-	%
Treatment Train	17	Discharges to Secondary Treatment in Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	18	Impervious Surface Area Still Requiring Treatment	0	0	0	0	0	0	0	-	-	-	square feet
	19	Impervious Surfaces Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
	20	Impervious Surfaces Not Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
Result	21	Deficit of Effectively Treated Stormwater	0	0	0	0	0	0	n/a	-	-	-	cubic-feet

Summary Notes:

All fields in this summary worksheet are populated based on previous user inputs. If applicable, drainage basin elements that require revisions and/or supplemental information outside the scope of these worksheets are highlighted in orange and summairzed in the red text below. If all drainage basins achieve full compliance without a need for supplemental information, a green message will appear below.

-Congratulations, all specified drainage basins and BMPs are in compliance with stormwater pollutant control requirements. Include 11x17 color prints of this summary sheet and supporting worksheet calculations as part of the SWQMP submittal package.

False

Categorization of Infiltration Feasibility Condition

Form I-8

Part 1 – Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☐	☒

Provide basis:

Majority of the site is soil type C + D, which typically have low infiltration rates.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☒

Provide basis:

Due to the presence of shallow bedrock throughout the site, infiltration could create seeps and slope stability concerns at the surface of the bedrock

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐

Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1-4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration.** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	**Full Infiltration Feasible** ☐	**Full Infiltration Infeasible** ☒

*To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings.

Categorization of Infiltration Feasibility Condition

Form I-8

<u>**Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria**</u>

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

<table>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td>☐</td><td>☒</td></tr>
<tr><td colspan="4">Provide basis:

Due to the steepness of the existing terrain and proposed grades in conjunction with shallow bedrock, infiltration could result in seepage and slope stability concerns.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>6</td><td>Can infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td>☐</td><td>☒</td></tr>
<tr><td colspan="4">Provide basis:

Due to the steepness of the existing terrain and proposed grades in conjunction with shallow bedrock, infiltration could result in seepage and slope stability concerns.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>7</td><td>Can infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☒</td><td>☐</td></tr>
<tr><td colspan="4">Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

<table>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☒</td><td>☐</td></tr>
<tr><td colspan="4">Provide basis:

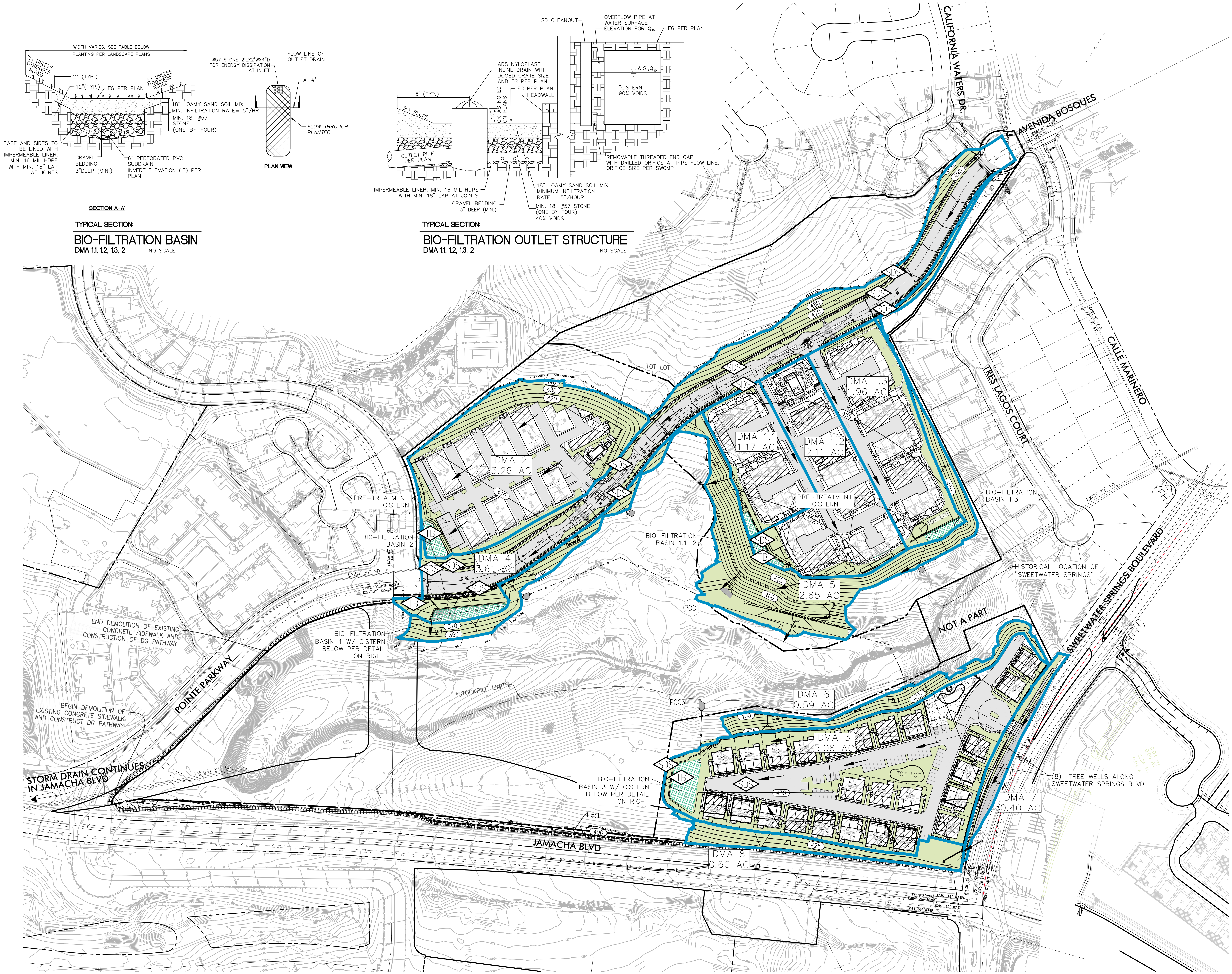
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td>If all answers to rows 1-4 are “Yes” a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.

If any answer from row 5-8 is “No”, infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.
Proceed to Part 2</td><td>Partial Infiltration
☐</td><td>No Infiltration
☒</td></tr>
</table>

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography and impervious areas
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed demolition
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Step 3.5)
☒ Structural BMPs (identify location, structural BMP ID#, type of BMP, and size/detail)



TYPICAL SECTION:

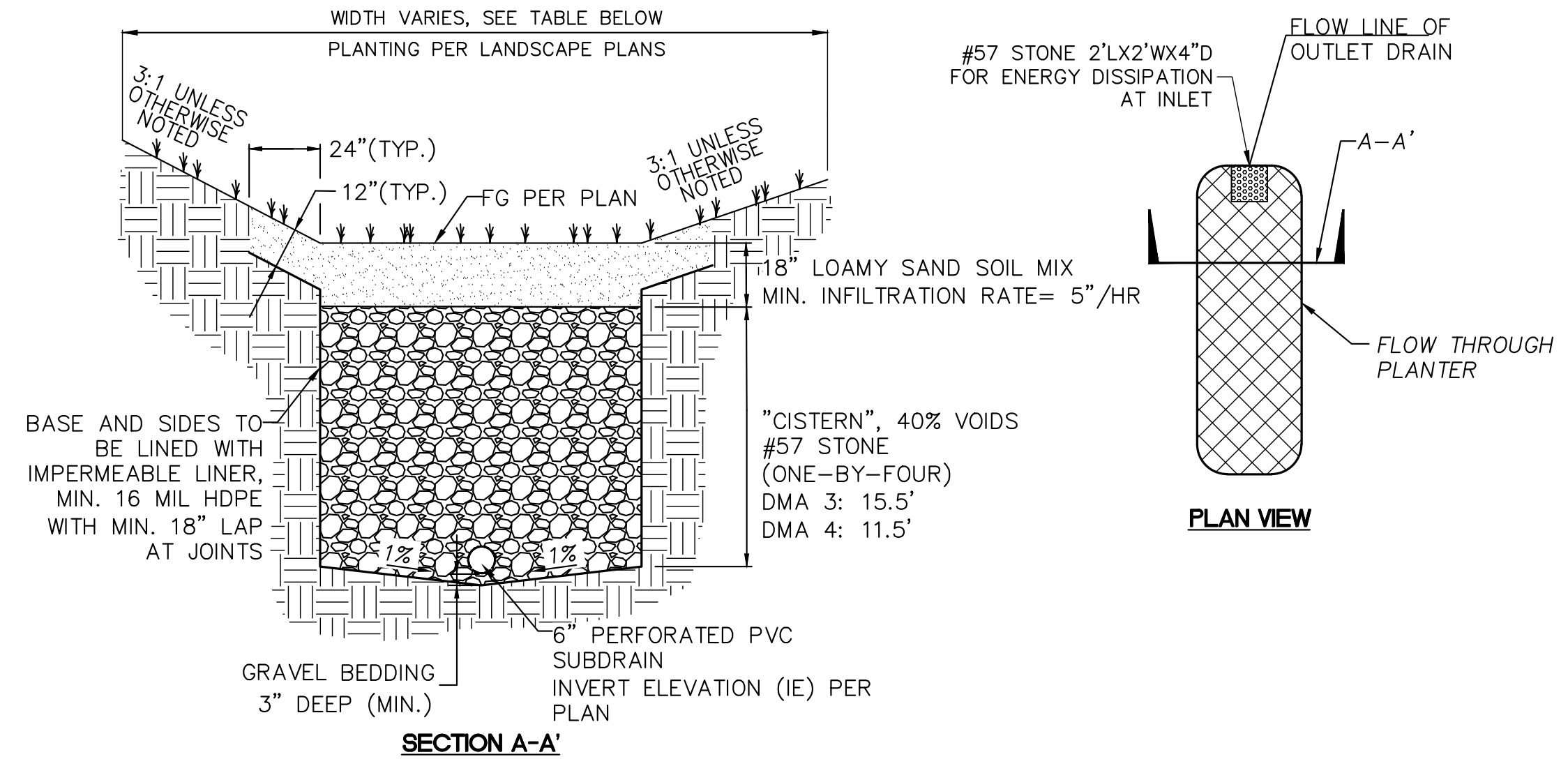
BIO-FILTRATION BASIN

DMA 1.1, 1.2, 1.3, 2 NO SCALE

TYPICAL SECTION:

BIO-FILTRATION OUTLET STRUCTURE

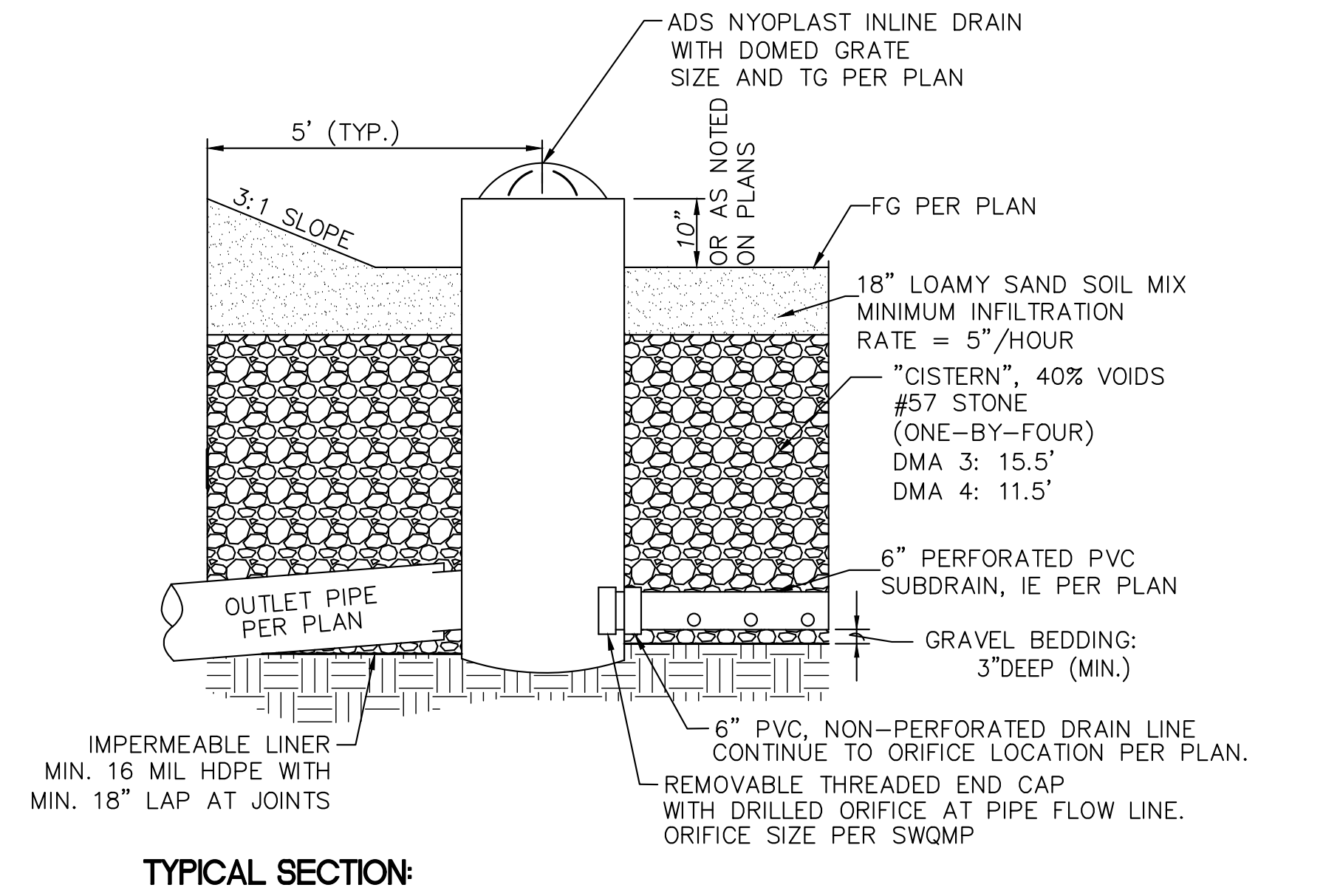
DMA 1.1, 1.2, 1.3, 2 NO SCALE



TYPICAL SECTION:

BIO-FILTRATION BASIN

DMA 3, 4 NO SCALE



TYPICAL SECTION:

BIO-FILTRATION OUTLET STRUCTURE

DMA 3, 4 NO SCALE

NOTE: THE SITE HAS NO CRITICAL COURSE YIELD AREAS TO BE PROTECTED

GROUNDWATER: IN SOME PLACES, GROUNDWATER CAN BE FOUND AS SHALLOW AS 5-10' BELOW GROUND

LEGEND

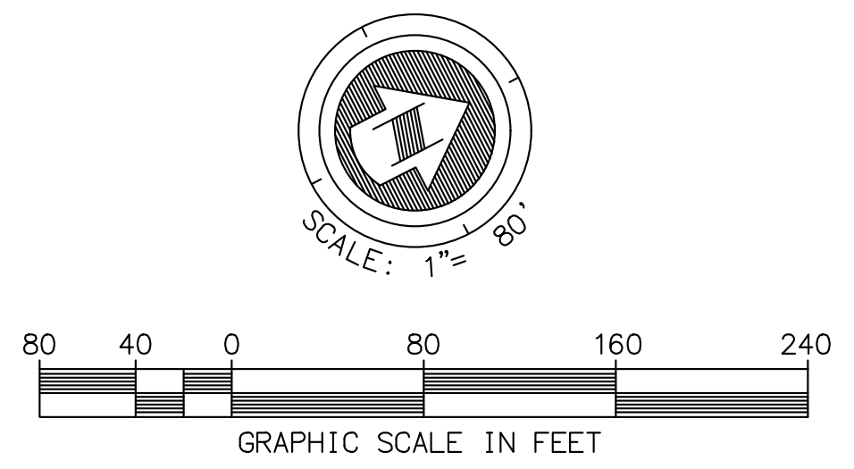
RIGHT OF WAY	— - - — - - —
STREET CENTERLINE	—— – ——
PROPOSED ASPHALT PAVEMENT	▭
PROPOSED BUILDINGS	▨
PROPOSED TREATMENT AREA	▩
PROPOSED CONCRETE	░
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
DISCHARGE POINT/POINT OF COMPLIANCE	POC
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB
SOIL TYPE BOUNDARY	▪▪▪▪▪▪

* SELF MITIGATING AREA NOTES:

1. VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
2. SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
3. THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
4. IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
5. THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

DMA ID	DMA AREAS (AC)	BMP ID	TYPE	BIOFILTRATION BASIN AREA (SF) REQUIRED	BIOFILTRATION BASIN AREA (SF) PROVIDED	CISTERN VOLUME (CF) REQUIRED	CISTERN VOLUME (CF) PROVIDED
1.1	1.17	1.1-2	BIOF + CISTERN	804	1,085	9,095	11,160
1.2	2.11	1.1-2	BIOF + CISTERN	1,410	1,907	15,954	16,065
1.3	1.96	1.3	BIOF + CISTERN	1,260	1,720	12,980	14,250
2	3.26	2	BIOF + CISTERN	1,772	2,670	21,069	22,100
3	5.06	3	BIOF + CISTERN	3,230	6,000	35,104	37,200
4	3.61	4	BIOF + CISTERN	1,761	4,000	18,600	26,400
5	2.65	N/A	SELF MITIGATING *	N/A	N/A	N/A	N/A
6	0.59	N/A	SELF MITIGATING *	N/A	N/A	N/A	N/A
7	0.40	7	BIOF (TREE WELLS)	2,229	2,233	N/A	N/A
8	0.60	N/A	SELF MITIGATING *	N/A	N/A	N/A	N/A

* SEE SELF MITIGATING AREA NOTES ON LEFT



ATTACHMENT 1C - DMA EXHIBIT
SWEETWATER VISTAS

COUNTY OF SAN DIEGO, CA
PROJECT NUMBER: 2780-002
DATE: NOVEMBER 4, 2016
SHEET 1 OF 1

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ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\SWMP\HYDROMOD AND DMA EXHIBIT.DWG (03-13-17 4:54:56PM) Plotted by: rroberts

STRUCTURAL BMP DMA MAPBOOK

DMA1.1, 1.2, 1.3 / BMP1.1-2 & 1.3

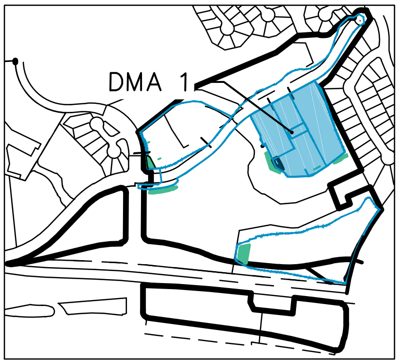
DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
1.1	1.1-2	2-HOA	*BF BASIN + CISTERN	✓	✓
1.2	1.1-2	2-HOA	*BF BASIN + CISTERN	✓	✓
1.3	1.3	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB

INDEX MAP
NO SCALE



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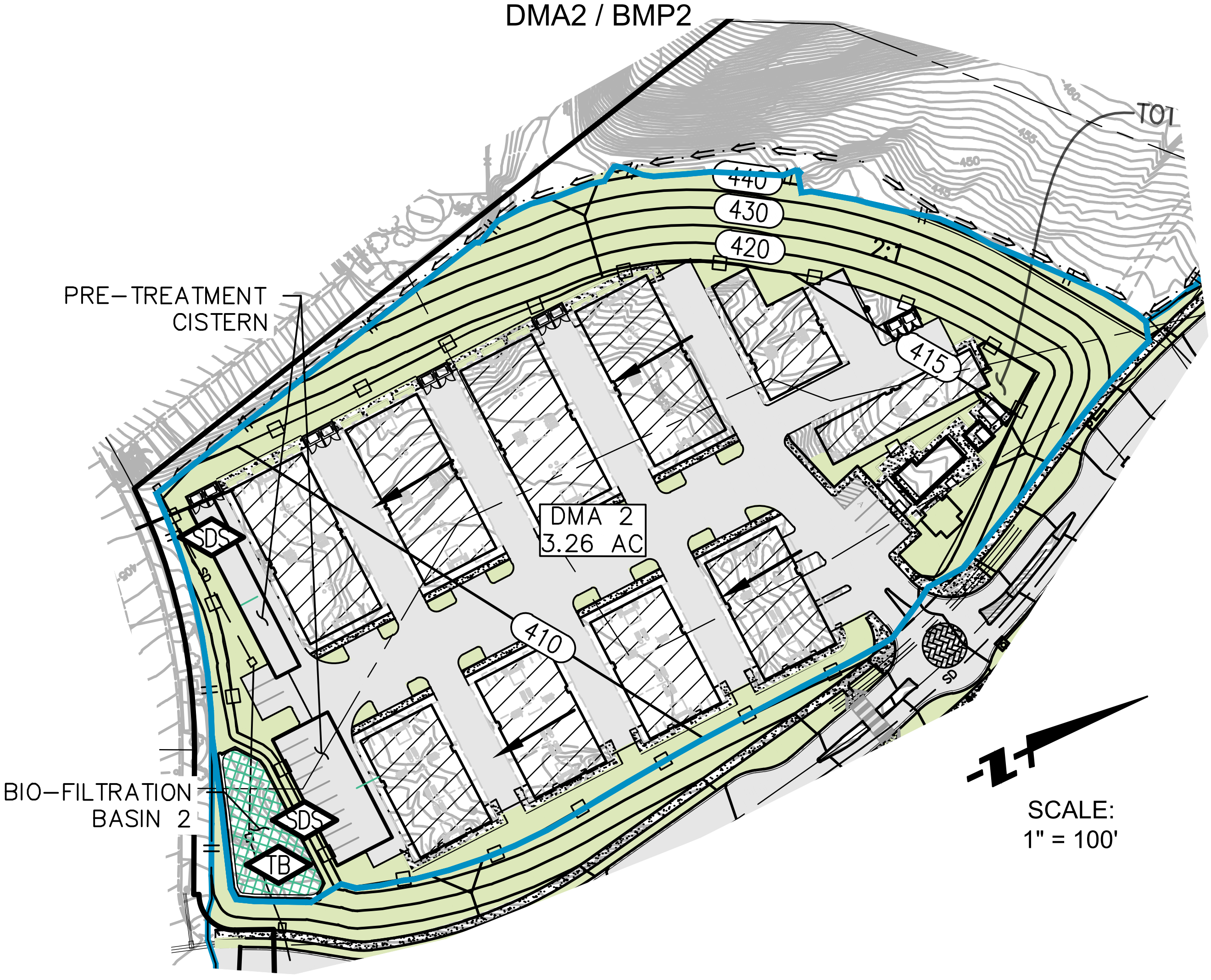
STRUCTURAL BMP DMA MAPBOOK

DMA2 / BMP2

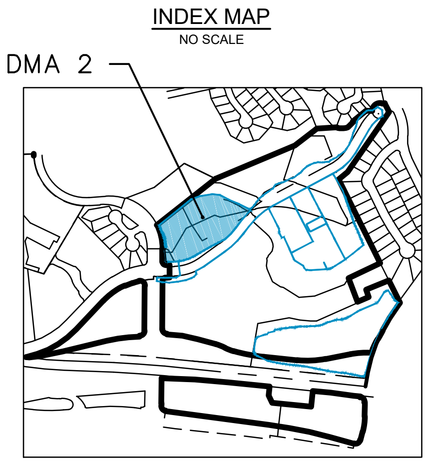


DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
2	2	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB



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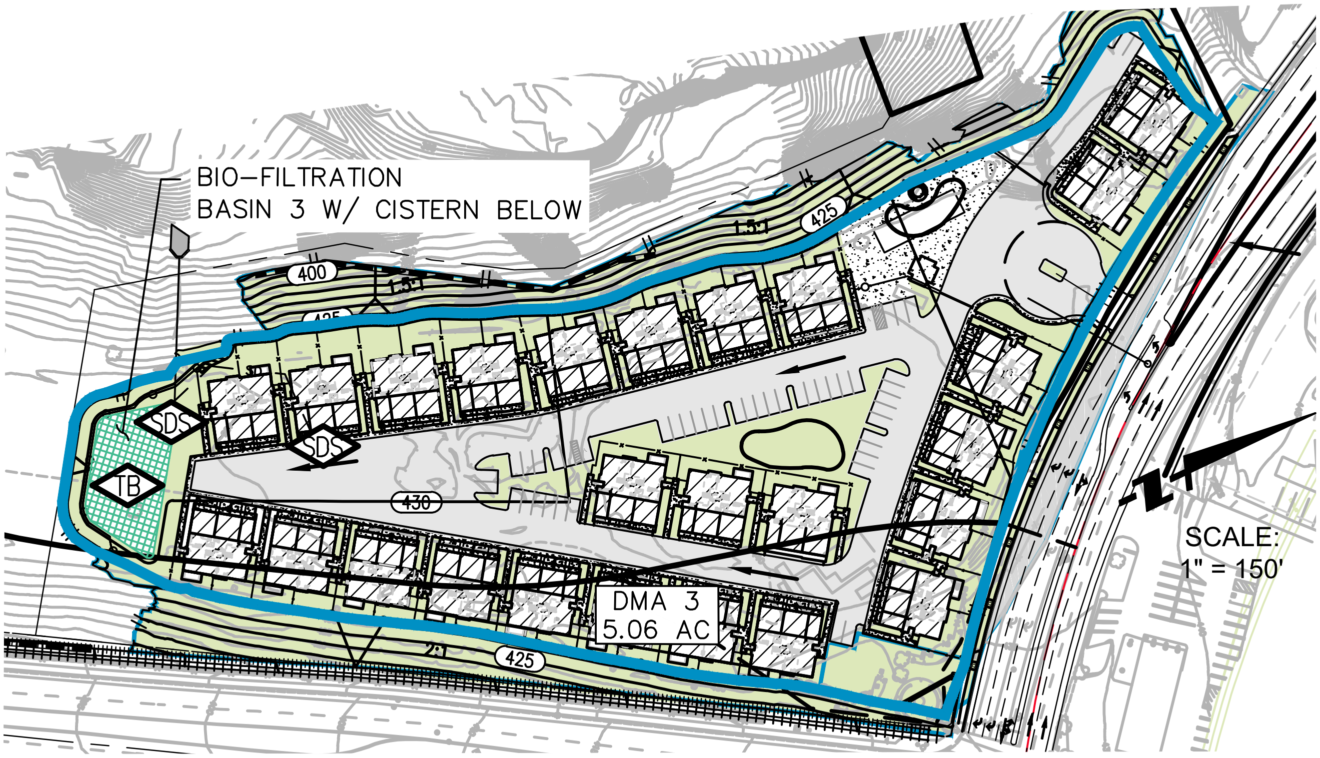
SWEETWATER VISTAS
STRUCTURAL BMP DMA MAPBOOK
DMA 3 / BMP 3



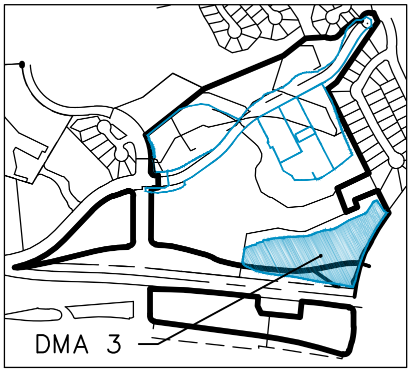
DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
3	3	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	▬
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB

INDEX MAP
NO SCALE



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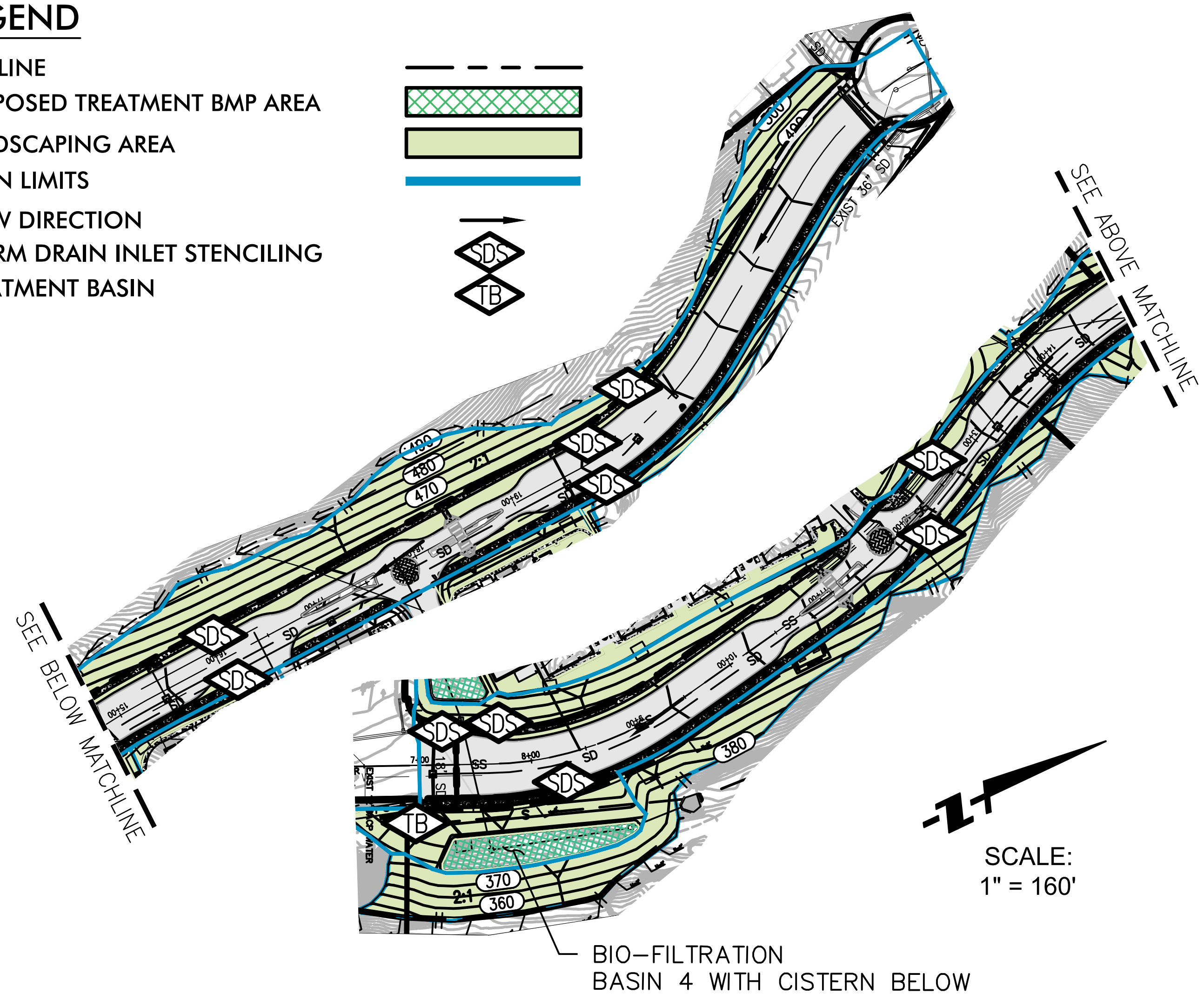
SWEETWATER VISTAS
STRUCTURAL BMP DMA MAPBOOK

DMA4 / BMP4

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB



DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
4	4	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

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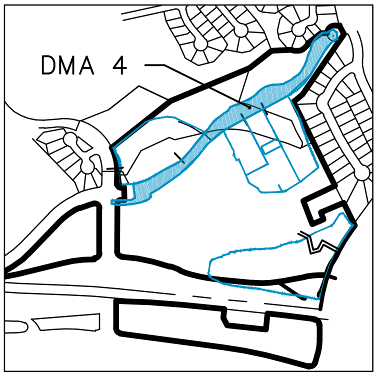

INDEX MAP
NO SCALE

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Appendix F Biofiltration Standard and Checklist

Introduction

The MS4 Permit and this manual define a specific category of storm water pollutant treatment BMPs called "biofiltration BMPs." The MS4 Permit (Section E.3.c.1) states:

Biofiltration BMPs must be designed to have an appropriate hydraulic loading rate to maximize storm water retention and pollutant removal, as well as to prevent erosion, scour, and channeling within the BMP, and must be sized to:

a) **Treat 1.5 times the DCV not reliably retained onsite, OR**

b) **Treat the DCV not reliably retained onsite with a flow-thru design that has a total volume, including pore spaces and pre-filter detention volume, sized to hold at least 0.75 times the portion of the DCV not reliably retained onsite.**

A project applicant must be able to affirmatively demonstrate that a given BMP is designed and sized in a manner consistent with this definition to be considered as a "biofiltration BMP" as part of a compliant storm water quality management plan. Retention is defined in the MS4 Permit as evapotranspiration, infiltration, and harvest and use of storm water vs. discharge to a surface water system.

Contents and Intended Uses

This appendix contains a checklist of the key underlying criteria that must be met for a BMP to be considered a biofiltration BMP. The purpose of this checklist is to facilitate consistent review and approval of biofiltration BMPs that meet the "biofiltration standard" defined by the MS4 Permit.

This checklist includes specific design criteria that are essential to defining a system as a biofiltration BMP; however it does not present a complete design basis. This checklist was used to develop BMP Fact Sheets for PR-1 biofiltration with partial retention and BF-1 biofiltration, which do present a complete design basis. Therefore, biofiltration BMPs that substantially meet all aspects of the Fact sheets PR-1 or BF-1 should be able to complete this checklist without additional documentation beyond what would already be required for a project submittal.

Other biofiltration BMP designs[20] (including both non-proprietary and proprietary designs) may also meet the underlying MS4 Permit requirements to be considered biofiltration BMPs. These BMPs may be classified as biofiltration BMPs if they (1) meet the minimum design criteria listed in this appendix, including the pollutant treatment performance standard in Appendix F.1, (2) are designed and maintained in a manner consistent with their performance certifications (See explanation in Appendix F.2), if applicable, and (3) are acceptable at the discretion of County staff. The applicant may be required to provide additional studies and/or required to meet additional design criteria beyond the scope of this document in order to demonstrate that these criteria are met.

Organization

The checklist in this appendix is organized into the seven (7) main objectives associated with biofiltration BMP design. It describes the associated minimum criteria that must be met in order to qualify a biofiltration BMP as meeting the biofiltration standard. The seven main objectives are listed below. Specific design criteria and associated manual references associated with each of these objectives is provided in the checklist in the following section.

1. Biofiltration BMPs must be allowed only as described in the BMP selection process in this manual (i.e., retention feasibility hierarchy).

2. Biofiltration BMPs must be sized using acceptable sizing methods described in this manual.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control/sequestration processes, and minimize potential for pollutant washout.

5. Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.

6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.

---

[20] Defined as biofiltration designs that do not conform to the specific design criteria described in Fact Sheets PR-1 or BF-1. This category includes proprietary BMPs that are sold by a vendor as well as non-proprietary BMPs that are designed and constructed of primarily of more elementary construction materials.

7. Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.

Biofiltration Criteria Checklist

The applicant must provide documentation of compliance with each criterion in this checklist as part of the project submittal. The right column of this checklist identifies the submittal information that is recommended to document compliance with each criterion. Biofiltration BMPs that substantially meet all aspects of Fact Sheets PR-1 or BF-1 should still use this checklist; however additional documentation (beyond what is already required for project submittal) should not be required.

1. Biofiltration BMPs must be allowed to be used only as described in the BMP selection process based on a documented feasibility analysis.

Intent: This manual defines a specific prioritization of pollutant treatment BMPs, where BMPs that retain water (retained includes evapotranspired, infiltrated, and/or harvested and used) must be used before considering BMPs that have a biofiltered discharge to the MS4 or surface waters. Use of a biofiltration BMP in a manner in conflict with this prioritization (i.e., without a feasibility analysis justifying its use) is not permitted, regardless of the adequacy of the sizing and design of the system.

☐	The project applicant has demonstrated that it is not technically feasible to retain the full DCV onsite.	Document feasibility analysis and findings in the SWQMP per Appendix C.

2. Biofiltration BMPs must be sized using acceptable sizing methods.

Intent: The MS4 Permit and this manual defines specific sizing methods that must be used to size biofiltration BMPs. Sizing of biofiltration BMPs is a fundamental factor in the amount of storm water that can be treated and also influences volume and pollutant retention processes.

☐	The project applicant has demonstrated that biofiltration BMPs are sized to meet one of the biofiltration sizing options available (Appendix B).	Submit sizing worksheets (Appendix B) or other equivalent documentation with the SWQMP.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

Intent: Various decisions about BMP placement and design influence how much water is retained via infiltration and evapotranspiration. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention (evapotranspiration and infiltration) of storm water volume.

☐	The biofiltration BMP is sited to allow for maximum infiltration of runoff volume based on the feasibility factors considered in site planning efforts. It is also designed to maximize evapotranspiration through the use of amended media and plants (biofiltration designs without amended media and plants may be permissible; see Item 5).	Document site planning and feasibility analyses in the SWQMP per Section 5.4.
☐	For biofiltration BMPs categorized as “Partial Infiltration Condition,” the infiltration storage depth in the biofiltration design has been selected to drain in 36 hours or an alternative value shown to maximize infiltration on the site.	Included documentation of estimated infiltration rate per Appendix D; provide calculations using Appendix B.4 and B.5 to show that the infiltration storage depth meets this criterion. Note, depths that are too shallow or too deep may not be acceptable.
☐	For biofiltration BMP locations categorized as “Partial Infiltration Condition,” the infiltration storage is over the entire bottom of the biofiltration BMP footprint.	Document on plans that the infiltration storage covers the entire bottom of the BMP (i.e., not just underdrain trenches); or an equivalent footprint elsewhere on the site.
☐	For biofiltration BMP locations categorized as “Partial Infiltration Condition,” the sizing factor used for the infiltration storage area is not less than the minimum biofiltration BMP sizing factors calculated using Worksheet B.5.3.	Provide a table that compares the minimum sizing factor from Appendix B.5 to the provided sizing factor. Note: The infiltration storage area could be a separate storage feature located downstream of the biofiltration BMP, not necessarily within the same footprint.
☐	An impermeable liner or other hydraulic restriction layer is only used when needed to avoid geotechnical and/or subsurface contamination issues in locations identified as “No Infiltration Condition.”	If using an impermeable liner or hydraulic restriction layer, provide documentation of feasibility findings per Appendix C that recommend the use of this feature.
	The use of “compact” biofiltration BMP design is permitted only in conditions identified as “No Infiltration Condition” and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible.	Provide documentation of feasibility findings that recommend no infiltration is feasible. Provide site-specific information to demonstrate that a larger footprint biofiltration BMP would not be feasible.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control processes, and minimize potential for pollutant washout.

Intent: Various decisions about biofiltration BMP design influence the degree to which pollutants are retained. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention of storm water pollutants.

☐	Media selected for the biofiltration BMP meets minimum quality and material specifications per 2016 City Storm Water Standards or County LID Manual, including the maximum allowable design filtration rate and minimum thickness of media.	Provide documentation that media meets the specifications in 2016 City Storm Water Standards or County LID Manual.
	OR	
☐	Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the 2016 City Storm Water Standards or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below.	Provide documentation of performance information as described in Section F.1.
☐	To the extent practicable, filtration rates are outlet controlled (e.g., via an underdrain and orifice/weir) instead of controlled by the infiltration rate of the media.	Include outlet control in designs or provide documentation of why outlet control is not practicable.
☐	The water surface drains to at least 12 inches below the media surface within 24 hours from the end of storm event flow to preserve plant health and promote healthy soil structure.	Include calculations to demonstrate that drawdown rate is adequate. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of County staff if certified by a landscape architect or agronomist.
☐	If nutrients are a pollutant of concern, design of the biofiltration BMP follows nutrient-sensitive design criteria.	Follow specifications for nutrient sensitive design in Fact Sheet BF-2. Or provide alternative documentation that nutrient treatment is addressed and potential for nutrient release is minimized.
☐	Media gradation calculations or geotextile selection calculations demonstrate that migration of media between layers will be prevented and permeability will be preserved.	Follow specification for choking layer or geotextile in Fact Sheet PR-1 or BF-1. Or include calculations to demonstrate that choking layer is appropriately specified.

5. **Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.**

   Intent: Biological processes are an important element of biofiltration performance and longevity.

☐	Plants have been selected to be tolerant of project climate, design ponding depths and the treatment media composition.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.20.
☐	Plants have been selected to minimize irrigation requirements.	Provide documentation describing irrigation requirements for establishment and long term operation.
☐	Plant location and growth will not impede expected long-term media filtration rates and will enhance long term infiltration rates to the extent possible.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.20.
☐	If plants are not part of the biofiltration design, other biological processes are supported as needed to sustain treatment processes (e.g., biofilm in a subsurface flow wetland).	For biofiltration designs without plants, describe the biological processes that will support effective treatment and how they will be sustained.

6. Biofiltration BMPs must be designed with a hydraulic loading rate to prevent erosion, scour, and channeling within the BMP.

Intent: Erosion, scour, and/or channeling can disrupt treatment processes and reduce biofiltration effectiveness.

☐	Scour protection has been provided for both sheet flow and pipe inflows to the BMP, where needed.	Provide documentation of scour protection as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	Where scour protection has not been provided, flows into and within the BMP are kept to non-erosive velocities.	Provide documentation of design checks for erosive velocities as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	For proprietary BMPs, the BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification[22] (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).	Provide copy of manufacturer recommendations and conditions of third-party certification.

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[22] Certifications or verifications issued by the Washington Technology Acceptance Protocol-Ecology program and the New Jersey Corporation for Advanced Technology programs are typically accompanied by a set of guidelines regarding appropriate design and maintenance conditions that would be consistent with the certification/verification

7. Biofiltration BMP must include operations and maintenance design features and planning considerations for continued effectiveness of pollutant and flow control functions.

Intent: Biofiltration BMPs require regular maintenance in order provide ongoing function as intended. Additionally, it is not possible to foresee and avoid potential issues as part of design; therefore plans must be in place to correct issues if they arise.

☐	The biofiltration BMP maintenance plan describes specific inspection activities, regular/periodic maintenance activities and specific corrective actions relating to scour, erosion, channeling, media clogging, vegetation health, and inflow and outflow structures.	Include maintenance plan with the SWQMP as described in Chapter 7.
☐	Adequate site area and features have been provided for BMP inspection and maintenance access.	Illustrate maintenance access routes, setbacks, maintenance features as needed on project water quality plans.
☐	For proprietary biofiltration BMPs, the BMP maintenance plan is consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies).	Provide copy of manufacturer recommendations and conditions of third-party certification.

E.7 SD-B Impervious Area Dispersion

MS4 Permit Category

Site Design

Manual Category

Site Design

Applicable Performance Criteria

Site Design

Primary Benefits

Volume Reduction
Peak Flow Attenuation

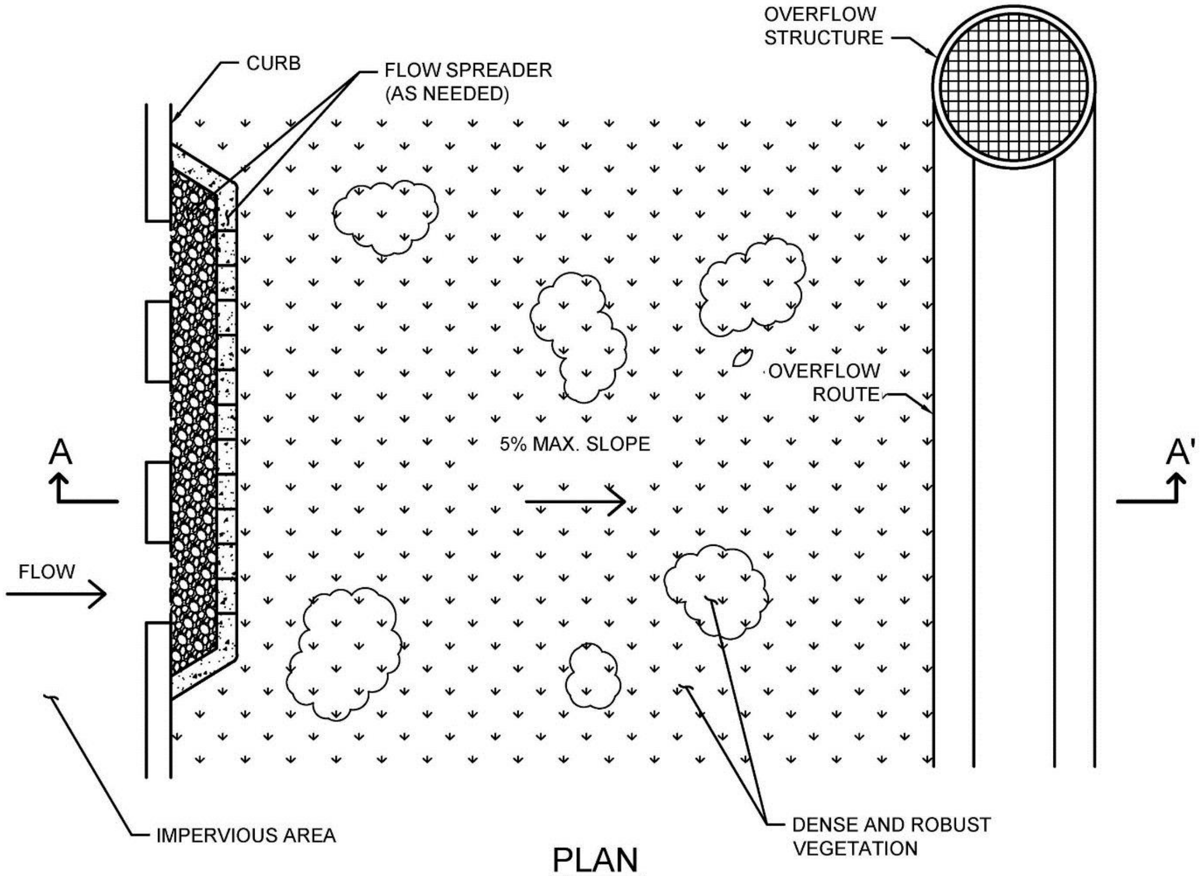
Photo Credit: Orange County Technical Guidance Document

Description

Impervious area dispersion (dispersion) refers to the practice of effectively disconnecting impervious areas from directly draining to the storm drain system by routing runoff from impervious areas such as rooftops (through downspout disconnection), walkways, and driveways onto the surface of adjacent pervious areas. The intent is to slow runoff discharges, and reduce volumes. Dispersion with partial or full infiltration results in significant volume reduction by means of infiltration and evapotranspiration.

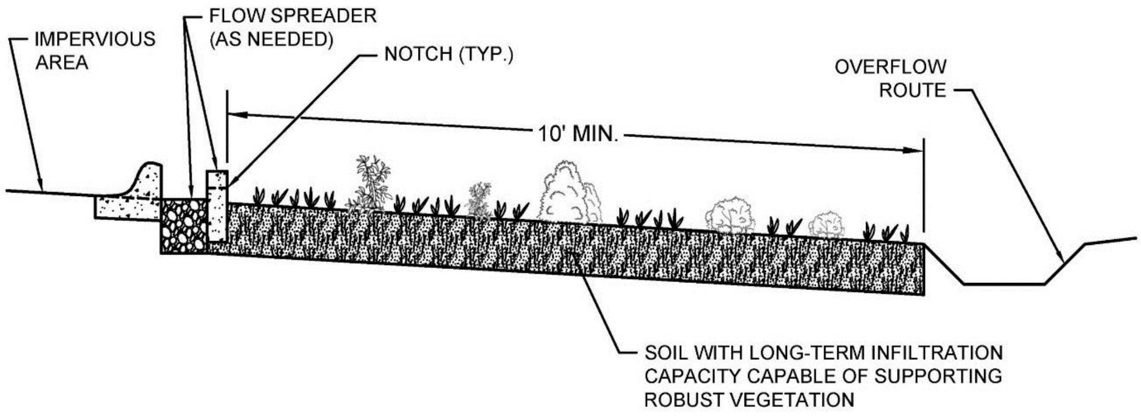
Typical dispersion components include:

- An impervious surface from which runoff flows will be routed with minimal piping to limit concentrated inflows
- Splash blocks, flow spreaders, or other means of dispersing concentrated flows and providing energy dissipation as needed
- Dedicated pervious area, typically vegetated, with in-situ soil infiltration capacity for partial or full infiltration
- Optional soil amendments to improve vegetation support, maintain infiltration rates and enhance treatment of routed flows
- Overflow route for excess flows to be conveyed from dispersion area to the storm drain system or discharge point



PLAN

NOT TO SCALE



SECTION A-A'

NOT TO SCALE

Typical plan and section view of an Impervious Area Dispersion BMP

Design Adaptations for Project Goals

Site design BMP to reduce impervious area and DCV. Impervious area dispersion primarily functions as a site design BMP for reducing the effective imperviousness of a site by providing partial or full infiltration of the flows that are routed to pervious dispersion areas and otherwise slowing down excess flows that eventually reach the storm drain system. This can significantly reduce the DCV for the site.

Design Criteria and Considerations

Dispersion must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of County Staff if it is determined to be appropriate:

	Siting and Design	***Intent/Rationale***
☐	**Impervious area dispersion Placement:** ensure area is graded; and located so that full DCV water drains to the area of dispersion	Minimizes short-circuiting of run off
☐	Dispersion is over areas with soil types capable of supporting or being amended (e.g., with sand or compost) to support vegetation. Media amendments must be tested to verify that they are not a source of pollutants.	Soil must have long-term infiltration capacity for partial or full infiltration and be able to support vegetation to provide runoff treatment. Amendments to improve plant growth must not have negative impact on water quality.
☐	Dispersion has vegetated sheet flow over a relatively large distance (minimum 10 feet) from inflow to overflow route.	Full or partial infiltration requires relatively large areas to be effective depending on the permeability of the underlying soils.
☐	Pervious areas should be flat (with less than 5% slopes) and vegetated.	Flat slopes facilitate sheet flows and minimize velocities, thereby improving treatment and reducing the likelihood of erosion.
	Inflow velocities	
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
	Dedication	

	Siting and Design	*Intent/Rationale*
☐	Dispersion areas must be owned by the project owner and be dedicated for the purposes of dispersion to the exclusion of other future uses that might reduce the effectiveness of the dispersion area.	Dedicated dispersion areas prevent future conversion to alternate uses and facilitate continued full and partial infiltration benefits.

	Vegetation	
☐	Dispersion typically requires dense and robust vegetation for proper function. Drought tolerant species should be selected to minimize irrigation needs. A plant list to aid in selection can be found in Appendix E.25.	Vegetation improves resistance to erosion and aids in runoff treatment.

Conceptual Design and Sizing Approach for Site Design

1. Determine the areas where dispersion can be used in the site design to reduce the DCV for pollutant control sizing.
2. Calculate the DCV for storm water pollutant control per Appendix B.2, taking into account reduced runoff from dispersion.
3. Determine if a DMA is considered “Self-retaining” if the impervious to pervious ratio is:
   a. 2:1 when the pervious area is composed of Hydrologic Soil Group A
   b. 1:1 when the pervious area is composed of Hydrologic Soil Group B

E.12 HU-1 Cistern

MS4 Permit Category
Retention

Manual Category
Harvest and Use

Applicable Performance Standards
Pollutant Control Flow Control

Primary Benefits
Volume Reduction Peak Flow Attenuation

Photo Credit: Water Environment Research Foundation: WERF.org

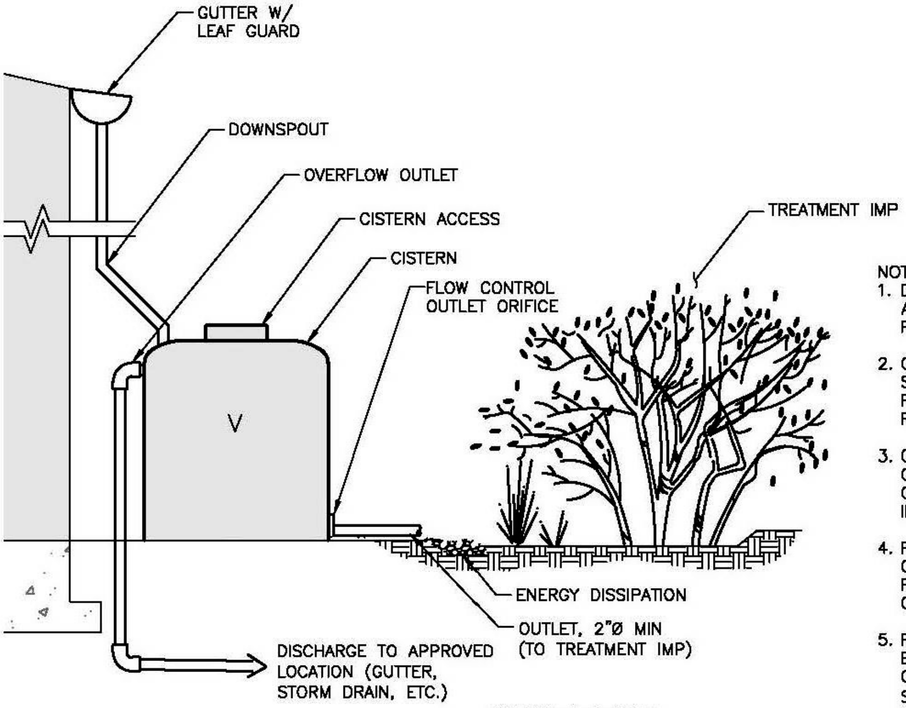
Description

Cisterns are containers that can capture rooftop runoff and store it for future use. With controlled timing and volume release, the captured rainwater can be used for irrigation or alternative grey water between storm events, thereby reducing runoff volumes and associated pollutants to downstream water bodies. Cisterns are larger systems (generally>100 gallons) that can be self-contained aboveground or below ground systems. Treatment can be achieved when cisterns are used as part of a treatment train along with other BMPs that use captured flows in applications that do not result in discharges into the storm drain system. Rooftops are the ideal tributary areas for cisterns.

Typical cistern components include:

- Storage container, barrel or tank for holding captured flows
- Inlet and associated valves and piping
- Outlet and associated valves and piping
- Overflow outlet
- Optional pump

- Optional first flush diverters
- Optional roof, supports, foundation, level indicator, and other accessories



NOTES:
1. DESIGNER SHALL ACCOUNT FOR AND ACCOMODATE FOR POSSIBLE OVERFLOW.
2. OVERFLOW OUTLET CAPACITY SHALL EQUAL OR EXCEED POTENTIAL RUNOFF VOLUME AND RATE.
3. CISTERN PROVIDES FLOW CONTROL ONLY. USE IN COMBINATION WITH TREATMENT IMP.
4. PROVIDE ACCESS FOR CLEAN OUT OF OUTLET ORIFICE. SEE FLOW-THROUGH PLANTER OUTLET DETAIL.
5. PREVENT MOSQUITO BREEDING BY SEALING OR SCREENING ALL OPENINGS TO THE WATER SURFACE AND/OR ENSURE COMPLETE DRAINAGE.

CISTERN

Source: City of San Diego Storm Water Standards

Design Adaptations for Project Goals

Site design BMP to reduce effective impervious area and DCV. Cisterns can be used as a site design feature to reduce the effective impervious area of the site by removing roof runoff from the site discharge. This can reduce the DCV and flow control requirements for the site.

Harvest and use for storm water pollutant control. Typical uses for captured flows include irrigation, toilet flushing, cooling system makeup, and vehicle and equipment washing.

Integrated storm water flow control and pollutant control configuration. Cisterns provide flow control in the form of volume reduction and/or peak flow attenuation and storm water treatment through elimination of discharges of pollutants. Additional flow control can be achieved by sizing the cistern to include additional detention storage and/or real-time automated flow release controls.

Design Criteria and Considerations

Cisterns must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of County staff if it is determined to be appropriate:

	Siting and Design	*Intent/Rationale*
☐	Cisterns are sized to detain the full DCV of contributing area and empty within 36 hours.	Draining the cistern makes the storage volume available to capture the next storm. The applicant has an option to use a different drawdown time up to 120 hours if the volume of the facility is adjusted using the percent capture method in Appendix B.4.1.
☐	Cisterns are fitted with a flow control device such as an orifice or a valve to limit outflow in accordance with drawdown time requirements.	Flow control provides flow attenuation benefits and limits cistern discharge to downstream facilities during storm events.
☐	Cisterns are designed to drain completely, leaving no standing water, and all entry points are fitted with traps or screens, or sealed.	Complete drainage and restricted entry prevents mosquito habitat.
☐	Leaf guards and/or screens are provided to prevent debris from accumulating in the cistern.	Leaves and organic debris can clog the outlet of the cistern.
☐	Access is provided for maintenance and the cistern outlets are accessible and designed to allow easy cleaning.	Properly functioning outlets are needed to maintain proper flow control in accordance with drawdown time requirements.
☐	Cisterns must be designed and sited such that overflow will be conveyed safely overland to the storm drain system or discharge point.	Safe overflow conveyance prevents flooding and damage of property.

Conceptual Design and Sizing Approach for Site Design and Storm Water Pollutant Control

1. Calculate the DCV for site design per Appendix B.
2. Determine the locations on the site where cisterns can be located to capture and detain the DCV from roof areas without subsequent discharge to the storm drain system. Cisterns are best located in close proximity to building and other roofed structures to minimize piping. Cisterns can also be used as part of a treatment train upstream by increasing pollutant control through delayed runoff to infiltration BMPs such as bioretention without underdrain facilities.

3. Use the sizing worksheet in Appendix B.3 to determine if full or partial capture of the DCV is achievable.
4. The remaining DCV to be treated should be calculated for use in sizing downstream BMP(s).

Conceptual Design and Sizing Approach when Storm Water Flow Control is Applicable

Control of flow rates and/or duration will typically require significant cistern volumes, and therefore the following steps should be taken prior to determination of site design and storm water pollutant control. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that cistern siting and design criteria have been met. Design for flow control can be achieved using various design configurations, shapes, and quantities of cisterns.
2. Iteratively determine the cistern storage volume required to provide detention storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control valve operation.
3. Verify that the cistern is drawdown within 36 hours. The drawdown time can be estimated by dividing the storage volume by the rate of use of harvested water.
4. If the cistern cannot fully provide the flow rate and duration control required by this manual, a downstream structure with additional storage volume or infiltration capacity such as a biofiltration can be used to provide remaining flow control.

E.13 INF-1 Infiltration Basin

MS4 Permit Category

Retention

Manual Category

Infiltration

Applicable Performance Standard

Pollutant Control
Flow Control

Primary Benefits

Volume Reduction
Peak Flow Attenuation

Photo Credit: http://www.storm waterpartners.com/facilities/basin.html

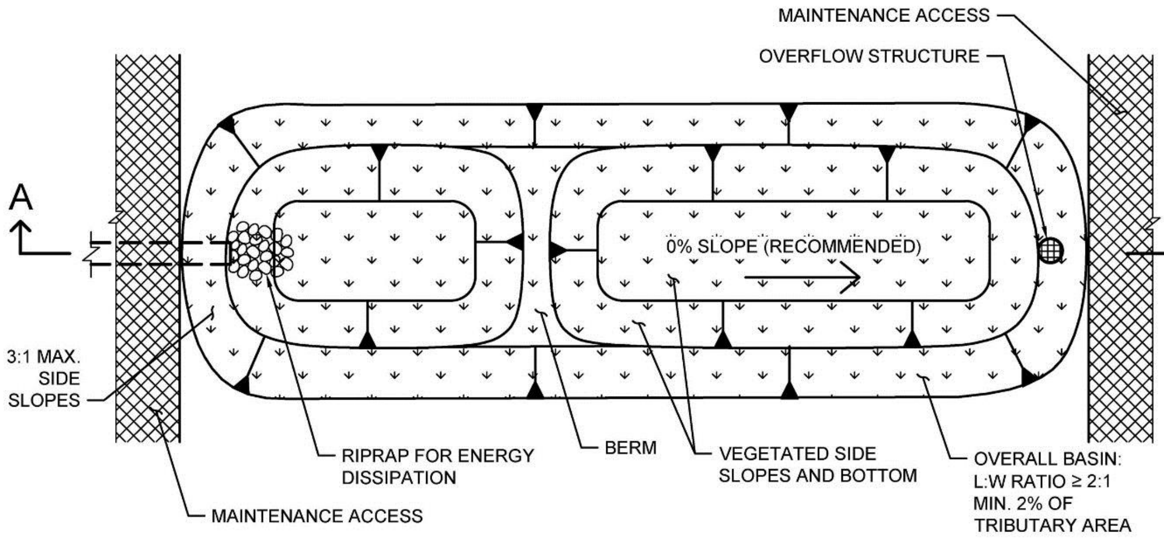
Description

An infiltration basin typically consists of an earthen basin with a flat bottom constructed in naturally pervious soils. An infiltration basin retains storm water and allows it to evaporate and/or percolate into the underlying soils. The bottom of an infiltration basin is typically vegetated with native grasses or turf grass; however other types of vegetation can be used if they can survive periodic inundation and long inter-event dry periods. Treatment is achieved primarily through infiltration, filtration, sedimentation, biochemical processes and plant uptake. Infiltration basins can be constructed as linear **trenches** or as **underground infiltration galleries**.

Typical infiltration basin components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Forebay to provide pretreatment surface ponding for captured flows
- Vegetation selected based on basin use, climate, and ponding depth
- Uncompacted native soils at the bottom of the facility

- Overflow structure



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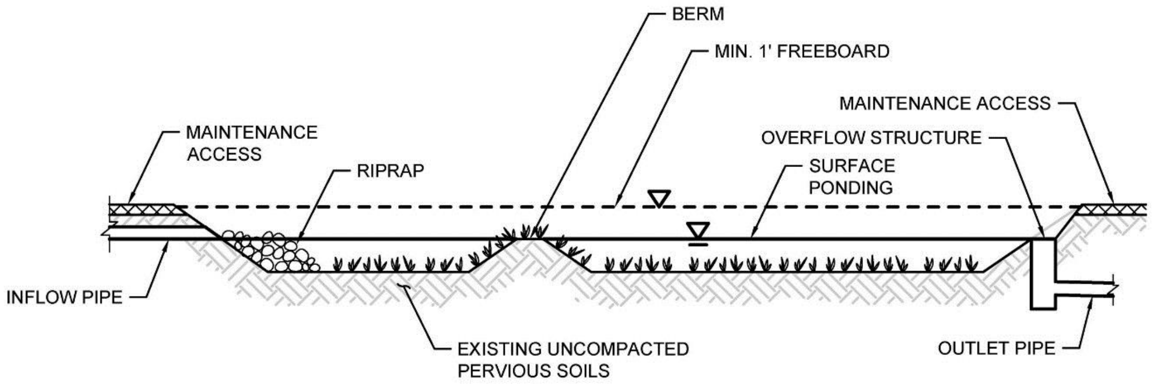

SECTION A-A'
NOT TO SCALE

Typical plan and section view of an Infiltration BMP

Design Adaptations for Project Goals

Full infiltration BMP for storm water pollutant control. Infiltration basins can be used as a pollutant control BMP, designed to infiltrate runoff from direct rainfall as well as runoff from adjacent areas that are tributary to the BMP. Infiltration basins must be designed with an infiltration storage volume (a function of the surface ponding volume) equal to the full DCV and able to meet drawdown time limitations.

Integrated storm water flow control and pollutant control configuration. Infiltration basins can also be designed for flow rate and duration control by providing additional infiltration storage through increasing the surface ponding volume.

Design Criteria and Considerations

Infiltration basins must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of County staff if it is determined to be appropriate:

Siting and Design		*Intent/Rationale*
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	Selection and design of basin is based on infiltration feasibility criteria and appropriate design infiltration rate (See Appendix C and D).	Must operate as a full infiltration design and must be supported by drainage area and in-situ infiltration rate feasibility findings.
☐	Finish grade of the facility is ≤ 2% (0% recommended).	Flatter surfaces reduce erosion and channelization with the facility.
☐	Settling forebay has a volume ≥ 25% of facility volume below the forebay overflow.	A forebay to trap sediment can decrease frequency of required maintenance.
☐	Infiltration of surface ponding is limited to a 36-hour drawdown time.	Prolonged surface ponding reduces volume available to capture subsequent storms. The applicant has an option to use a surface drawdown time of up to 96 hours if the volume of the facility is adjusted using the percent capture method in Appendix B.4.1.
☐	Minimum freeboard provided is ≥1 foot.	Freeboard minimizes risk of uncontrolled surface discharge.
☐	Side slopes are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.

Inflow and Overflow Structures		
☐	Inflow and outflow structures are accessible by required equipment (e.g., vactor truck) for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point. Size overflow structure to pass 100-year peak flow for on-line basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control

To design infiltration basins for storm water pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement and basin area requirements, forebay volume, and maximum slopes for basin sides and bottom.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Use the sizing worksheet (Appendix B.4) to determine if full infiltration of the DCV is achievable based on the infiltration storage volume calculated from the surface ponding area and depth for a maximum 36-hour drawdown time. The drawdown time can be estimated by dividing the average depth of the basin by the design infiltration rate. Appendix D provides guidance on evaluating a site's infiltration rate.

Conceptual Design and Sizing Approach for Storm Water Pollutant Treatment and Flow Control

Control of flow rates and/or durations will typically require significant surface ponding volume, and therefore the following steps should be taken prior to determination of storm water pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that siting and design criteria have been met, including placement and basin area requirements, forebay volume, and maximum slopes for basin sides and bottom.

2. Iteratively determine the surface ponding required to provide infiltration storage to reduce flow rates and durations to allowable limits while adhering to the maximum 36-hour drawdown time. Flow rates and durations can be controlled using flow splitters that route the appropriate inflow amounts to the infiltration basin and bypass excess flows to the downstream storm drain system or discharge point.
3. If an infiltration basin cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with appropriate storage volume such as an underground vault can be used to provide additional control.
4. After the infiltration basin has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 2a	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2b	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2c	Management of Critical Coarse Sediment Yield Areas See Section 6.2 and Appendix H of the BMP Design Manual.	☒ Exhibit depicting onsite and/or upstream sources of critical coarse sediment as mapped by Regional or Jurisdictional approaches outlined in Appendix H.1 AND, ☒ Demonstration that the project effectively avoids and bypasses sources of mapped critical coarse sediment per approaches outlined in Appendix H.2 and H.3. OR, ☐ Demonstration that project does not generate a net impact on the receiving water per approaches outlined in Appendix H.4.
Attachment 2d	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☒ Included ☐ Not required because BMPs will drain in less than 96 hours

DMA 1.1

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas
Project Applicant:	Sweewater Vistas, LLC
Jurisdiction:	County of San diego
Parcel (APN):	505-672-23 & 505-672-37
Hydrologic Unit:	Sweetwater
Rain Gauge:	Oceanside
Total Project Area (sf):	1.17
Channel Susceptibility:	High

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweewater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	1
Parcel (APN):	505-672-23 & 505-672-37	Low Flow Threshold:	0.1Q2
BMP Name:	Bio-Retention 1.1	BMP Type:	Cistern
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.08

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)[1]	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
Flat-Perv->Perv	1630	C	Flat	Landscaping	0.1	N/A	0.26	N/A	N/A	42	N/A
Flat-Perv->Imp	5283	C	Flat	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	1374	N/A
Mod-Perv->Perv	3575	C	Moderate	Landscaping	0.1	N/A	0.26	N/A	N/A	93	N/A
Mod-Perv->Imp	11749	C	Moderate	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	3055	N/A
Steep-Perv->Perv	6691	C	Steep	Landscaping	0.1	N/A	0.2	N/A	N/A	134	N/A
Steep-Perv->Imp	21987	C	Steep	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	4397	N/A
Total BMP Area	50,915							Minimum BMP Size		9095	
								Proposed BMP Size*	1085	N/A	N/A
								Minimum Cistern Depth		N/A	in
								Maximum Cistern Depth		N/A	in
								Selected Cistern Depth		72.00	in
								Selected Cistern Volume		11160	cubic feet

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, February 2016. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweewater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	1
Parcel (APN):	05-672-23 & 505-672-3	Low Flow Threshold:	0.1Q2
BMP Name	Bio-Retention 1.1	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
Flat-Perv->Perv	Oceanside	C	Scrub	Flat	0.146	0.037	0.001	**0.01**
Flat-Perv->Imp	Oceanside	C	Scrub	Flat	0.146	0.121	0.002	**0.02**
Mod-Perv->Perv	Oceanside	C	Scrub	Moderate	0.185	0.082	0.002	**0.02**
Mod-Perv->Imp	Oceanside	C	Scrub	Moderate	0.185	0.270	0.005	**0.07**
Steep-Perv->Perv	Oceanside	C	Scrub	Steep	0.217	0.154	0.003	**0.04**
Steep-Perv->Imp	Oceanside	C	Scrub	Steep	0.217	0.505	0.011	**0.14**
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					

0.023	**0.30**	**0.62**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.023	**0.28**	**0.60**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

DMA 1.2

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas
Project Applicant:	Sweetwater Vistas, LLC
Jurisdiction:	County of San diego
Parcel (APN):	505-672-23 & 505-672-37
Hydrologic Unit:	Sweetwater
Rain Gauge:	Oceanside
Total Project Area (sf):	2.11
Channel Susceptibility:	High

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	2
Parcel (APN):	505-672-23 & 505-672-37	Low Flow Threshold:	0.1Q2
BMP Name:	Bio-Retention 1.2	BMP Type:	Cistern
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.08

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)[1]	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
Flat-Perv->Perv	3284	C	Flat	Landscaping	0.1	N/A	0.26	N/A	N/A	85	N/A
Flat-Perv->Imp	9232	C	Flat	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	2400	N/A
Mod-Perv->Perv	7203	C	Moderate	Landscaping	0.1	N/A	0.26	N/A	N/A	187	N/A
Mod-Perv->Imp	20515	C	Moderate	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	5334	N/A
Steep-Perv->Perv	13483	C	Steep	Landscaping	0.1	N/A	0.2	N/A	N/A	270	N/A
Steep-Perv->Imp	38388	C	Steep	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	7678	N/A
Total BMP Area	92,105							Minimum BMP Size		15954	
								Proposed BMP Size*	1907	N/A	N/A
									Minimum Cistern Depth	N/A	in
									Maximum Cistern Depth	N/A	in
									Selected Cistern Depth	108.00	in
									Selected Cistern Volume	16065	cubic feet

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, February 2016. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	2
Parcel (APN):	05-672-23 & 505-672-3	Low Flow Threshold:	0.1Q2
BMP Name	Bio-Retention 1.2	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
Flat-Perv->Perv	Oceanside	C	Scrub	Flat	0.146	0.075	0.001	**0.01**
Flat-Perv->Imp	Oceanside	C	Scrub	Flat	0.146	0.212	0.003	**0.03**
Mod-Perv->Perv	Oceanside	C	Scrub	Moderate	0.185	0.165	0.003	**0.03**
Mod-Perv->Imp	Oceanside	C	Scrub	Moderate	0.185	0.471	0.009	**0.09**
Steep-Perv->Perv	Oceanside	C	Scrub	Steep	0.217	0.310	0.007	**0.07**
Steep-Perv->Imp	Oceanside	C	Scrub	Steep	0.217	0.881	0.019	**0.20**
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					

0.042	**0.45**	**0.75**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.039	**0.38**	**0.70**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

DMA 1.3

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas
Project Applicant:	Sweetwater Vistas, LLC
Jurisdiction:	County of San diego
Parcel (APN):	505-672-23 & 505-672-37
Hydrologic Unit:	Sweetwater
Rain Gauge:	Oceanside
Total Project Area (sf):	1.96
Channel Susceptibility:	High

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	2
Parcel (APN):	505-672-23 & 505-672-37	Low Flow Threshold:	0.1Q2
BMP Name:	Bio-Retention 1.3	BMP Type:	Cistern
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.08

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)[1]	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
Flat-Perv->Perv	3407	C	Flat	Landscaping	0.1	N/A	0.26	N/A	N/A	89	N/A
Flat-Perv->Imp	8225	C	Flat	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	2139	N/A
Mod-Perv->Perv	7542	C	Moderate	Landscaping	0.1	N/A	0.26	N/A	N/A	196	N/A
Mod-Perv->Imp	18204	C	Moderate	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	4733	N/A
Steep-Perv->Perv	14106	C	Steep	Landscaping	0.1	N/A	0.2	N/A	N/A	282	N/A
Steep-Perv->Imp	34050	C	Steep	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	6810	N/A
Total BMP Area	85,534							Minimum BMP Size		14248	
								Proposed BMP Size*	1720	N/A	N/A
								Minimum Cistern Depth		N/A	in
								Maximum Cistern Depth		N/A	in
								Selected Cistern Depth		60.00	in
								Selected Cistern Volume		14250	cubic feet

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	2
Parcel (APN):	05-672-23 & 505-672-3	Low Flow Threshold:	0.1Q2
BMP Name	Bio-Retention 1.3	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
Flat-Perv->Perv	Oceanside	C	Scrub	Flat	0.146	0.078	0.001	**0.02**
Flat-Perv->Imp	Oceanside	C	Scrub	Flat	0.146	0.189	0.003	**0.04**
Mod-Perv->Perv	Oceanside	C	Scrub	Moderate	0.185	0.173	0.003	**0.05**
Mod-Perv->Imp	Oceanside	C	Scrub	Moderate	0.185	0.418	0.008	**0.11**
Steep-Perv->Perv	Oceanside	C	Scrub	Steep	0.217	0.324	0.007	**0.10**
Steep-Perv->Imp	Oceanside	C	Scrub	Steep	0.217	0.782	0.017	**0.24**
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					

0.039	**0.56**	**0.84**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.038	**0.50**	**0.80**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

DMA 2

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas
Project Applicant:	Sweetwater Vistas, LLC
Jurisdiction:	County of San diego
Parcel (APN):	505-672-03 & 505-672-23
Hydrologic Unit:	Sweetwater
Rain Gauge:	Oceanside
Total Project Area (sf):	3.26
Channel Susceptibility:	High

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	3
Parcel (APN):	505-672-03 & 505-672-23	Low Flow Threshold:	0.1Q2
BMP Name:	Bio-Retention 2	BMP Type:	Cistern
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.08

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)[1]	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
Flat-Perv->Perv	17038	C	Flat	Landscaping	0.1	N/A	0.26	N/A	N/A	443	N/A
Flat-Perv->Imp	23671	C	Flat	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	6154	N/A
Mod-Perv->Perv	20441	C	Moderate	Landscaping	0.1	N/A	0.26	N/A	N/A	531	N/A
Mod-Perv->Imp	28398	C	Moderate	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	7383	N/A
Steep-Perv->Perv	22012	C	Steep	Landscaping	0.1	N/A	0.2	N/A	N/A	440	N/A
Steep-Perv->Imp	30580	C	Steep	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	6116	N/A
Total BMP Area	142,140							Minimum BMP Size		21069	
								Proposed BMP Size*	2670	N/A	N/A
								Minimum Cistern Depth		N/A	in
								Maximum Cistern Depth		N/A	in
								Selected Cistern Depth		60.00	in
								Selected Cistern Volume		22100	cubic feet

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	3
Parcel (APN):	05-672-03 & 505-672-2	Low Flow Threshold:	0.1Q2
BMP Name	Bio-Retention 2	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
Flat-Perv->Perv	Oceanside	C	Scrub	Flat	0.146	0.391	0.006	**0.08**
Flat-Perv->Imp	Oceanside	C	Scrub	Flat	0.146	0.543	0.008	**0.11**
Mod-Perv->Perv	Oceanside	C	Scrub	Moderate	0.185	0.469	0.009	**0.12**
Mod-Perv->Imp	Oceanside	C	Scrub	Moderate	0.185	0.652	0.012	**0.17**
Steep-Perv->Perv	Oceanside	C	Scrub	Steep	0.217	0.505	0.011	**0.16**
Steep-Perv->Imp	Oceanside	C	Scrub	Steep	0.217	0.702	0.015	**0.22**
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					

0.061	**0.87**	**1.05**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.059	**0.79**	**1.00**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

DMA 3

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas
Project Applicant:	Sweetwater Vistas, LLC
Jurisdiction:	County of San diego
Parcel (APN):	505-672-03
Hydrologic Unit:	Sweetwater
Rain Gauge:	Oceanside
Total Project Area (sf):	5.06
Channel Susceptibility:	High

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	5
Parcel (APN):	505-672-03	Low Flow Threshold:	0.1Q2
BMP Name:	Bio-Rentention 3	BMP Type:	Cistern
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.08

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)^1	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
C-Flat-Perv->Perv	16195	C	Flat	Landscaping	0.1	N/A	0.26	N/A	N/A	421	N/A
C-Flat-Perv->Imp	36421	C	Flat	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	9469	N/A
C-Mod-Perv->Perv	6045	C	Moderate	Landscaping	0.1	N/A	0.26	N/A	N/A	157	N/A
C-Mod-Perv->Imp	13595	C	Moderate	Pavement/Bldgs	1.0	N/A	0.26	N/A	N/A	3535	N/A
C-Steep-Perv->Perv	5837	C	Steep	Landscaping	0.1	N/A	0.2	N/A	N/A	117	N/A
C-Steep-Perv->Imp	13127	C	Steep	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	2625	N/A
D-Flat-Perv->Perv	20248	D	Flat	Landscaping	0.1	N/A	0.2	N/A	N/A	405	N/A
D-Flat-Perv->Imp	52956	D	Flat	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	10591	N/A
D-Mod-Perv->Perv	8790	D	Moderate	Landscaping	0.1	N/A	0.2	N/A	N/A	176	N/A
D-Mod-Perv->Imp	19767	D	Moderate	Pavement/Bldgs	1.0	N/A	0.2	N/A	N/A	3953	N/A
D-Steep-Perv->Perv	8487	D	Steep	Landscaping	0.1	N/A	0.18	N/A	N/A	153	N/A
D-Steep-Perv->Imp	19087	D	Steep	Pavement/Bldgs	1.0	N/A	0.18	N/A	N/A	3436	N/A
Total BMP Area	220,555							Minimum BMP Size		35038	
								Proposed BMP Size*	6000	N/A	N/A

Minimum Cistern Depth	N/A	in
Maximum Cistern Depth	N/A	in
Selected Cistern Depth	186.00	in
Selected Cistern Volume	37200	cubic feet

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	5
Parcel (APN):	505-672-03	Low Flow Threshold:	0.1Q2
BMP Name	Bio-Rentention 3	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
C-Flat-Perv->Perv	Oceanside	C	Scrub	Flat	0.146	0.372	0.005	**0.04**
C-Flat-Perv->Imp	Oceanside	C	Scrub	Flat	0.146	0.836	0.012	**0.10**
C-Mod-Perv->Perv	Oceanside	C	Scrub	Moderate	0.185	0.139	0.003	**0.02**
C-Mod-Perv->Imp	Oceanside	C	Scrub	Moderate	0.185	0.312	0.006	**0.05**
C-Steep-Perv->Perv	Oceanside	C	Scrub	Steep	0.217	0.134	0.003	**0.02**
C-Steep-Perv->Imp	Oceanside	C	Scrub	Steep	0.217	0.301	0.007	**0.05**
D-Flat-Perv->Perv	Oceanside	D	Scrub	Flat	0.175	0.465	0.008	**0.07**
D-Flat-Perv->Imp	Oceanside	D	Scrub	Flat	0.175	1.216	0.021	**0.17**
D-Mod-Perv->Perv	Oceanside	D	Scrub	Moderate	0.212	0.202	0.004	**0.03**
D-Mod-Perv->Imp	Oceanside	D	Scrub	Moderate	0.212	0.454	0.010	**0.08**
D-Steep-Perv->Perv	Oceanside	D	Scrub	Steep	0.244	0.195	0.005	**0.04**
D-Steep-Perv->Imp	Oceanside	D	Scrub	Steep	0.244	0.438	0.011	**0.09**
			Scrub					
			Scrub					
			Scrub					

0.094	**0.76**	**0.99**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.084	**0.64**	**0.90**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

DMA 4

BMP Sizing Spreadsheet V2.0

Project Name:	Sweetwater Vistas
Project Applicant:	Sweetwater Vistas, LLC
Jurisdiction:	County of San diego
Parcel (APN):	505-672-03, 505-672-23 & 505-672-37
Hydrologic Unit:	Sweetwater
Rain Gauge:	Oceanside
Total Project Area (sf):	3.61
Channel Susceptibility:	High

BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	4
Parcel (APN):	5-672-03, 505-672-23 & 505-672-	Low Flow Threshold:	0.1Q2
BMP Name:	Bio-Retention 4	BMP Type:	Cistern
BMP Native Soil Type:	C	BMP Infiltration Rate (in/hr):	0.08

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)[1]	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
C- Flat-Perv->Perv	3103	C	Flat	Landscaping	0.1	N/A	0.26	N/A	N/A	81	N/A
C- Flat-Perv->Imp	3618	C	Flat	AC/Sidewalk	1.0	N/A	0.26	N/A	N/A	941	N/A
C- Mod-Perv->Perv	12445	C	Moderate	Landscaping	0.1	N/A	0.26	N/A	N/A	324	N/A
C- Mod-Perv->Imp	14512	C	Moderate	AC/Sidewalk	1.0	N/A	0.26	N/A	N/A	3773	N/A
C- Steep-Perv->Perv	42411	C	Steep	Landscaping	0.1	N/A	0.2	N/A	N/A	848	N/A
C- Steep-Perv->Imp	49444	C	Steep	AC/Sidewalk	1.0	N/A	0.2	N/A	N/A	9889	N/A
D- Flat-Perv->Perv	2412	D	Flat	Landscaping	0.1	N/A	0.2	N/A	N/A	48	N/A
D-Flat-Perv->Imp	1640	D	Flat	AC/Sidewalk	1.0	N/A	0.2	N/A	N/A	328	N/A
D-Mod-Perv->Perv	3810	D	Moderate	Landscaping	0.1	N/A	0.2	N/A	N/A	76	N/A
D-Mod-Perv->Imp	2589	D	Moderate	AC/Sidewalk	1.0	N/A	0.2	N/A	N/A	518	N/A
D-Steep-Perv->Perv	12637	D	Steep	Landscaping	0.1	N/A	0.18	N/A	N/A	227	N/A
D-Steep-Perv->Imp	8594	D	Steep	AC/Sidewalk	1.0	N/A	0.18	N/A	N/A	1547	N/A
Total BMP Area	157,215							Minimum BMP Size		18600	
								Proposed BMP Size*	4000	N/A	N/A
								Minimum Cistern Depth		N/A	in
								Maximum Cistern Depth		N/A	in
								Selected Cistern Depth		198.00	in
								Selected Cistern Volume		26400	cubic feet

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

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BMP Sizing Spreadsheet V2.0			
Project Name:	Sweetwater Vistas	Hydrologic Unit:	Sweetwater
Project Applicant:	Sweetwater Vistas, LLC	Rain Gauge:	Oceanside
Jurisdiction:	County of San diego	Total Project Area:	4
Parcel (APN):	2-03, 505-672-23 & 505-	Low Flow Threshold:	0.1Q2
BMP Name	Bio-Retention 4	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
C- Flat-Perv->Perv	Oceanside	C	Scrub	Flat	0.146	0.071	0.001	**0.01**
C- Flat-Perv->Imp	Oceanside	C	Scrub	Flat	0.146	0.083	0.001	**0.01**
C- Mod-Perv->Perv	Oceanside	C	Scrub	Moderate	0.185	0.286	0.005	**0.04**
C- Mod-Perv->Imp	Oceanside	C	Scrub	Moderate	0.185	0.333	0.006	**0.05**
C- Steep-Perv->Perv	Oceanside	C	Scrub	Steep	0.217	0.974	0.021	**0.17**
C- Steep-Perv->Imp	Oceanside	C	Scrub	Steep	0.217	1.135	0.025	**0.19**
D- Flat-Perv->Perv	Oceanside	D	Scrub	Flat	0.175	0.055	0.001	**0.01**
D-Flat-Perv->Imp	Oceanside	D	Scrub	Flat	0.175	0.038	0.001	**0.01**
D-Mod-Perv->Perv	Oceanside	D	Scrub	Moderate	0.212	0.087	0.002	**0.01**
D-Mod-Perv->Imp	Oceanside	D	Scrub	Moderate	0.212	0.059	0.001	**0.01**
D-Steep-Perv->Perv	Oceanside	D	Scrub	Steep	0.244	0.290	0.007	**0.06**
D-Steep-Perv->Imp	Oceanside	D	Scrub	Steep	0.244	0.197	0.005	**0.04**
			Scrub					
			Scrub					
			Scrub					

0.076	**0.60**	**0.87**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.086	**0.64**	**0.90**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

BMP
1.1 Drawdown Calculation

Cd	A	H	√(2gH)	Q	Volume	Time (hours)
0.60	0.0019	6.00	19.66	0.0229	930	11.26
0.60	0.0019	5.50	18.82	0.0220	930	11.77
0.60	0.0019	5.00	17.94	0.0209	930	12.34
0.60	0.0019	4.50	17.02	0.0199	930	13.01
0.60	0.0019	4.00	16.05	0.0187	930	13.80
0.60	0.0019	3.50	15.01	0.0175	930	14.75
0.60	0.0019	3.00	13.90	0.0162	930	15.93
0.60	0.0019	2.50	12.69	0.0148	930	17.45
0.60	0.0019	2.00	11.35	0.0132	930	19.51
0.60	0.0019	1.50	9.83	0.0115	930	22.53
0.60	0.0019	1.00	8.02	0.0094	930	27.59
0.60	0.0019	0.50	5.67	0.0066	930	39.02
					11,160	218.96

BMP
1.2 Drawdown Calculation

Cd	A	H	√(2gH)	Q	Volume	Time (hours)
0.60	0.0026	9.00	24.07	0.0381	893	6.50
0.60	0.0026	8.50	23.40	0.0370	893	6.69
0.60	0.0026	8.00	22.70	0.0359	893	6.90
0.60	0.0026	7.50	21.98	0.0348	893	7.12
0.60	0.0026	7.00	21.23	0.0336	893	7.37
0.60	0.0026	6.50	20.46	0.0324	893	7.65
0.60	0.0026	6.00	19.66	0.0311	893	7.97
0.60	0.0026	5.50	18.82	0.0298	893	8.32
0.60	0.0026	5.00	17.94	0.0284	893	8.73
0.60	0.0026	4.50	17.02	0.0270	893	9.20
0.60	0.0026	4.00	16.05	0.0254	893	9.76
0.60	0.0026	3.50	15.01	0.0238	893	10.43
0.60	0.0026	3.00	13.90	0.0220	893	11.26
0.60	0.0026	2.50	12.69	0.0201	893	12.34
0.60	0.0026	2.00	11.35	0.0180	893	13.80
0.60	0.0026	1.50	9.83	0.0156	893	15.93
0.60	0.0026	1.00	8.02	0.0127	893	19.51
0.60	0.0026	0.50	5.67	0.0090	893	27.59
					16,065	197.08

BMP
1.3 Drawdown Calculation

Cd	A	H	√(2gH)	Q	Volume	Time (hours)
0.60	0.0035	5.00	17.94	0.0374	1,425	10.59
0.60	0.0035	4.50	17.02	0.0355	1,425	11.16
0.60	0.0035	4.00	16.05	0.0334	1,425	11.84
0.60	0.0035	3.50	15.01	0.0313	1,425	12.66
0.60	0.0035	3.00	13.90	0.0290	1,425	13.67
0.60	0.0035	2.50	12.69	0.0264	1,425	14.97
0.60	0.0035	2.00	11.35	0.0236	1,425	16.74
0.60	0.0035	1.50	9.83	0.0205	1,425	19.33
0.60	0.0035	1.00	8.02	0.0167	1,425	23.68
0.60	0.0035	0.50	5.67	0.0118	1,425	33.48
					14,250	168.12

BMP
2.0 Drawdown Calculation

Cd	A	H	√(2gH)	Q	Volume	Time (hours)
0.60	0.0055	5.00	17.94	0.0591	2,210	10.39
0.60	0.0055	4.50	17.02	0.0560	2,210	10.96
0.60	0.0055	4.00	16.05	0.0528	2,210	11.62
0.60	0.0055	3.50	15.01	0.0494	2,210	12.42
0.60	0.0055	3.00	13.90	0.0458	2,210	13.42
0.60	0.0055	2.50	12.69	0.0418	2,210	14.70
0.60	0.0055	2.00	11.35	0.0374	2,210	16.43
0.60	0.0055	1.50	9.83	0.0324	2,210	18.98
0.60	0.0055	1.00	8.02	0.0264	2,210	23.24
0.60	0.0055	0.50	5.67	0.0187	2,210	32.87
					22,100	165.02

BMP
3.0 Drawdown Calculation

Cd	A	H	√(2gH)	Q	Volume	Time (hours)
0.60	0.0044	15.50	31.59	0.0843	1,200	3.96
0.60	0.0044	15.00	31.08	0.0829	1,200	4.02
0.60	0.0044	14.50	30.56	0.0815	1,200	4.09
0.60	0.0044	14.00	30.03	0.0801	1,200	4.16
0.60	0.0044	13.50	29.49	0.0786	1,200	4.24
0.60	0.0044	13.00	28.93	0.0772	1,200	4.32
0.60	0.0044	12.50	28.37	0.0757	1,200	4.41
0.60	0.0044	12.00	27.80	0.0741	1,200	4.50
0.60	0.0044	11.50	27.21	0.0726	1,200	4.59
0.60	0.0044	11.00	26.62	0.0710	1,200	4.70
0.60	0.0044	10.50	26.00	0.0693	1,200	4.81
0.60	0.0044	10.00	25.38	0.0677	1,200	4.93
0.60	0.0044	9.50	24.73	0.0660	1,200	5.05
0.60	0.0044	9.00	24.07	0.0642	1,200	5.19
0.60	0.0044	8.50	23.40	0.0624	1,200	5.34
0.60	0.0044	8.00	22.70	0.0605	1,200	5.51
0.60	0.0044	7.50	21.98	0.0586	1,200	5.69
0.60	0.0044	7.00	21.23	0.0566	1,200	5.89
0.60	0.0044	6.50	20.46	0.0546	1,200	6.11
0.60	0.0044	6.00	19.66	0.0524	1,200	6.36
0.60	0.0044	5.50	18.82	0.0502	1,200	6.64
0.60	0.0044	5.00	17.94	0.0479	1,200	6.97
0.60	0.0044	4.50	17.02	0.0454	1,200	7.34
0.60	0.0044	4.00	16.05	0.0428	1,200	7.79
0.60	0.0044	3.50	15.01	0.0400	1,200	8.33
0.60	0.0044	3.00	13.90	0.0371	1,200	8.99
0.60	0.0044	2.50	12.69	0.0338	1,200	9.85
0.60	0.0044	2.00	11.35	0.0303	1,200	11.01
0.60	0.0044	1.50	9.83	0.0262	1,200	12.72
0.60	0.0044	1.00	8.02	0.0214	1,200	15.58
0.60	0.0044	0.50	5.67	0.0151	1,200	22.03
					37,200	215.10

BMP
4.0 Drawdown Calculation

Cd	A	H	√(2gH)	Q	Volume	Time (hours)
0.60	0.0044	16.50	32.60	0.0869	800	2.56
0.60	0.0044	16.00	32.10	0.0856	800	2.60
0.60	0.0044	15.50	31.59	0.0843	800	2.64
0.60	0.0044	15.00	31.08	0.0829	800	2.68
0.60	0.0044	14.50	30.56	0.0815	800	2.73
0.60	0.0044	14.00	30.03	0.0801	800	2.78
0.60	0.0044	13.50	29.49	0.0786	800	2.83
0.60	0.0044	13.00	28.93	0.0772	800	2.88
0.60	0.0044	12.50	28.37	0.0757	800	2.94
0.60	0.0044	12.00	27.80	0.0741	800	3.00
0.60	0.0044	11.50	27.21	0.0726	800	3.06
0.60	0.0044	11.00	26.62	0.0710	800	3.13
0.60	0.0044	10.50	26.00	0.0693	800	3.20
0.60	0.0044	10.00	25.38	0.0677	800	3.28
0.60	0.0044	9.50	24.73	0.0660	800	3.37
0.60	0.0044	9.00	24.07	0.0642	800	3.46
0.60	0.0044	8.50	23.40	0.0624	800	3.56
0.60	0.0044	8.00	22.70	0.0605	800	3.67
0.60	0.0044	7.50	21.98	0.0586	800	3.79
0.60	0.0044	7.00	21.23	0.0566	800	3.92
0.60	0.0044	6.50	20.46	0.0546	800	4.07
0.60	0.0044	6.00	19.66	0.0524	800	4.24
0.60	0.0044	5.50	18.82	0.0502	800	4.43
0.60	0.0044	5.00	17.94	0.0479	800	4.64
0.60	0.0044	4.50	17.02	0.0454	800	4.90
0.60	0.0044	4.00	16.05	0.0428	800	5.19
0.60	0.0044	3.50	15.01	0.0400	800	5.55
0.60	0.0044	3.00	13.90	0.0371	800	6.00
0.60	0.0044	2.50	12.69	0.0338	800	6.57
0.60	0.0044	2.00	11.35	0.0303	800	7.34
0.60	0.0044	1.50	9.83	0.0262	800	8.48
0.60	0.0044	1.00	8.02	0.0214	800	10.38
0.60	0.0044	0.50	5.67	0.0151	800	14.69
					26,400	148.55

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

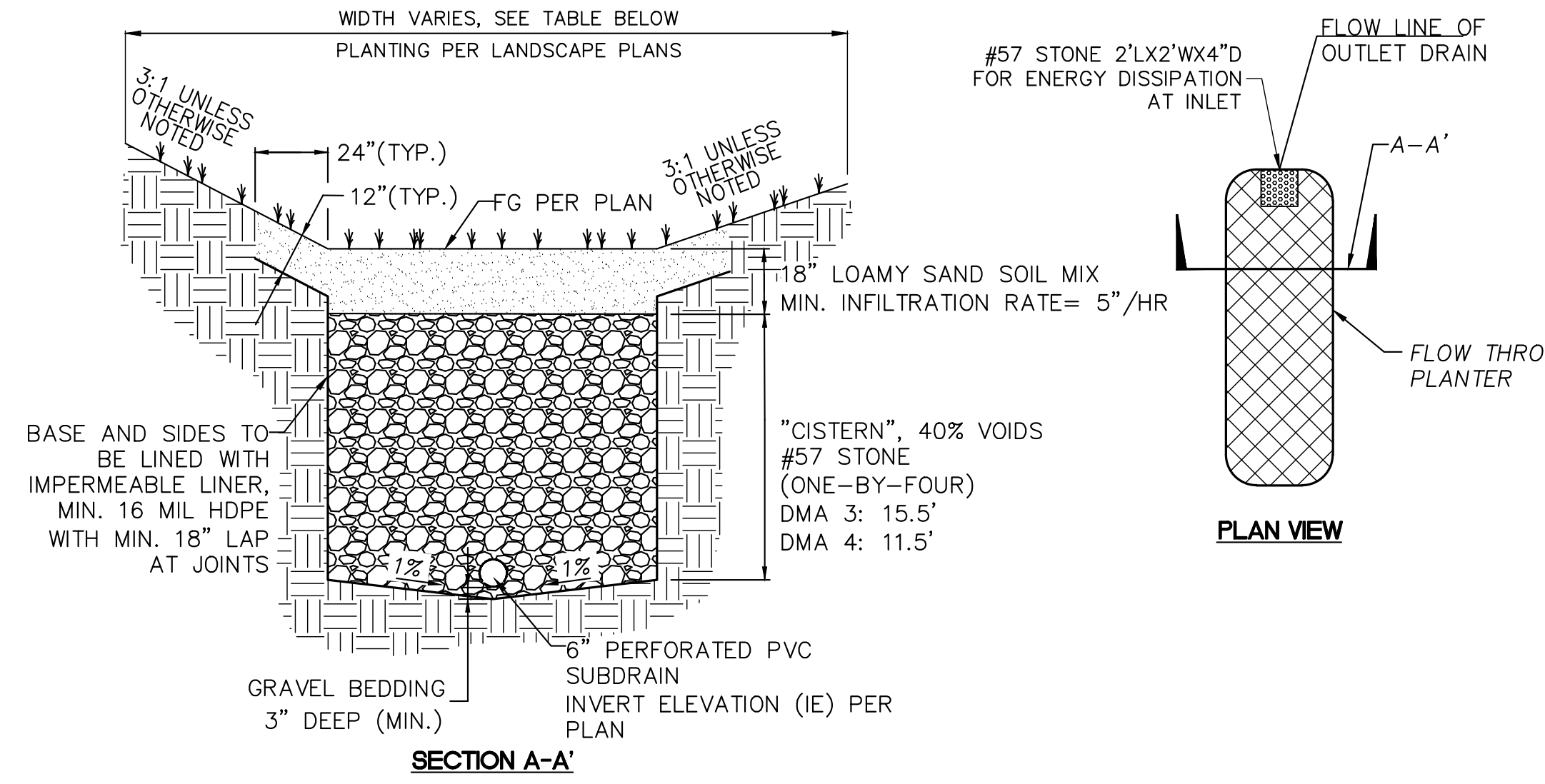
☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Point(s) of Compliance (POC) for Hydromodification Management
☒ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

TYPICAL SECTION:

BIO-FILTRATION BASIN
DMA 1.1, 1.2, 1.3, 2 NO SCALE

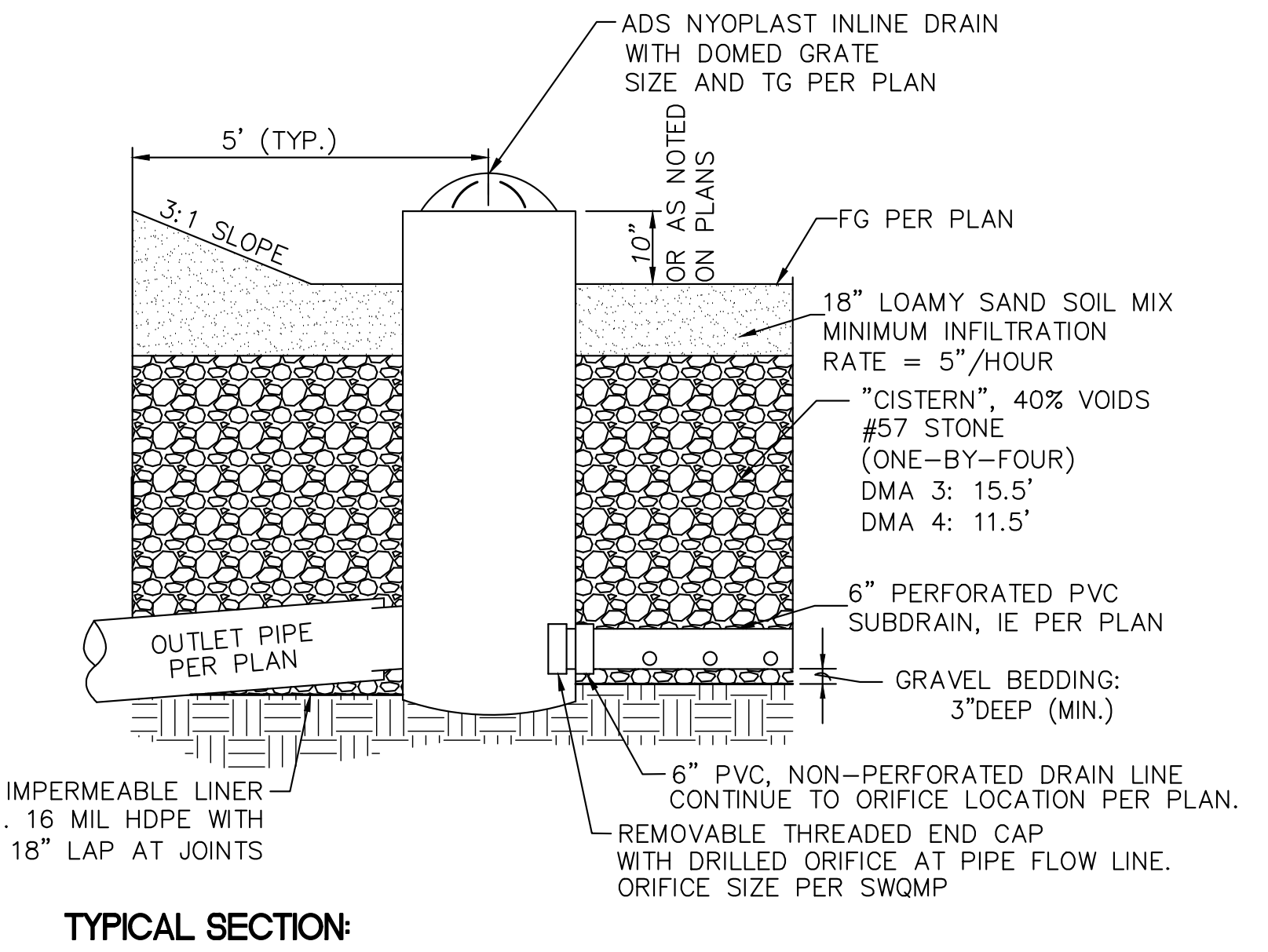
TYPICAL SECTION:

BIO-FILTRATION OUTLET STRUCTURE
DMA 1.1, 1.2, 1.3, 2 NO SCALE



TYPICAL SECTION:

BIO-FILTRATION BASIN
DMA 3, 4 NO SCALE



TYPICAL SECTION:

BIO-FILTRATION OUTLET STRUCTURE
DMA 3, 4 NO SCALE

NOTE: THE SITE HAS NO CRITICAL COURSE YIELD AREAS TO BE PROTECTED

GROUNDWATER: IN SOME PLACES, GROUNDWATER CAN BE FOUND AS SHALLOW AS 5-10' BELOW GROUND

LEGEND

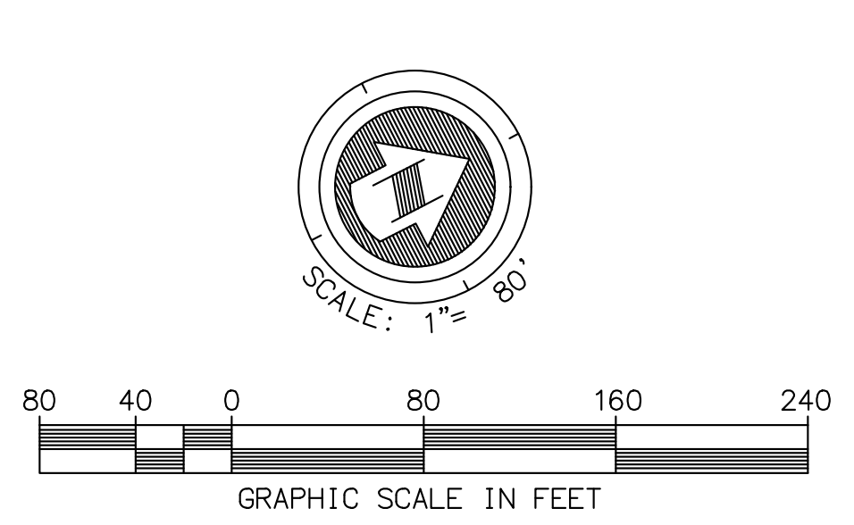
RIGHT OF WAY	— · — · —
STREET CENTERLINE	— — —
PROPOSED ASPHALT PAVEMENT	▭
PROPOSED BUILDINGS	▨
PROPOSED TREATMENT AREA	▨
PROPOSED CONCRETE	▭
LANDSCAPING AREA	🟩
BASIN LIMITS	━━━
FLOW DIRECTION	→
DISCHARGE POINT/POINT OF COMPLIANCE	POC
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB
SOIL TYPE BOUNDARY	┅┅┅

* SELF MITIGATING AREA NOTES:

1. VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
2. SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
3. THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
4. IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
5. THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

DMA ID	DMA AREAS (AC)	BMP ID	TYPE	BIOFILTRATION BASIN AREA (SF) REQUIRED	BIOFILTRATION BASIN AREA (SF) PROVIDED	CISTERN VOLUME (CF) REQUIRED	CISTERN VOLUME (CF) PROVIDED
1.1	1.17	1.1-2	BIOF + CISTERN	804	1,085	9,095	11,160
1.2	2.11	1.1-2	BIOF + CISTERN	1,410	1,907	15,954	16,065
1.3	1.96	1.3	BIOF + CISTERN	1,260	1,720	12,980	14,250
2	3.26	2	BIOF + CISTERN	1,772	2,670	21,069	22,100
3	5.06	3	BIOF + CISTERN	3,230	6,000	35,104	37,200
4	3.61	4	BIOF + CISTERN	1,761	4,000	18,600	26,400
5	2.65	N/A	SELF MITIGATING *	N/A	N/A	N/A	N/A
6	0.59	N/A	SELF MITIGATING *	N/A	N/A	N/A	N/A
7	0.40	7	BIOF (TREE WELLS)	2,229	2,233	N/A	N/A
8	0.60	N/A	SELF MITIGATING *	N/A	N/A	N/A	N/A

* SEE SELF MITIGATING AREA NOTES ON LEFT



HYDROMODIFICATION MANAGEMENT PLAN
SWEETWATER VISTAS
COUNTY OF SAN DIEGO, CA
PROJECT NUMBER: 2780-002
DATE: NOVEMBER 4, 2016
SHEET 1 OF 1

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

Attachment 2B

FUSCOE
ENGINEERING

6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

LEGEND

▪▪▪▪▪▪▪ PROPERTY BOUNDARY

🟩 NO POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA PER THE SAN DIEGO BAY WATERSHED POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS MAP

🟨 POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA PER THE SAN DIEGO BAY WATERSHED POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS MAP

SCALE: 1"= 200'

200 100 0 200 400 600

GRAPHIC SCALE IN FEET

SWEETWATER VISTAS
CRITICAL COARSE SEDIMENT EXHIBIT
FEBRUARY 8, 2016

Attachment 2E

Vector Control

Summary of Drawdown Times

BMP ID	Drawdown Time per Attachment 2D (hrs)	Less than 96 Hours?	Type of Storage
Bioretention 1.1	219	**No**	Cistern
Bioretention 1.2	197	**No**	Cistern
Bioretention 1.3	168	**No**	Cistern
Bioretention 2	165	**No**	Cistern
Bioretention 3	215	**No**	Surface
Bioretention 4	149	**No**	Surface

As shown in the summary table above, all but one BMP will have a drawdown time greater than 96 hours. In order to minimize vector breeding sources, the structural BMPs will be designed with the following vector control criteria:

- Cisterns will be underground, allowing for them to be completely sealed against mosquitos.
- Covers will be tight fitting with maximum allowable gaps or holes of less than 1⁄16 inch (2 mm) to exclude entry of adult mosquitoes.
- The cistern inlet and outlet will be submerged to reduce the available surface area of water for mosquito egg-laying (female mosquitoes can fly through pipes).
- All cisterns will have spring-loaded or lightweight access points to allow safe access and easy inspection and/or dewatering if required. This allows vector control personnel to effectively monitor and, if necessary, abate vectors.

Upon final engineering, a vector control plan will be implemented in accordance with the “County of San Diego Guidelines for Determining Significance, Vectors” dated July 30, 2007.

ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 3a	Structural BMP Maintenance Plan (Required)	☒ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Stormwater Maintenance Notification / Agreement (when applicable)	☐ Included ☒ Not Applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Attachment 3a must identify:

☐ Specific maintenance indicators and actions for proposed structural BMP(s). This must be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For all Structural BMPs, Attachment 3b must include a draft maintenance agreement in the County's standard format depending on the Category (PDP applicant to contact County staff to obtain the current maintenance agreement forms). Refer to Section 7.3 in the BMP Design Manual for a description of the different categories.

MAINTENANCE

Maintenance of the proposed BMP will be performed by the to-be-formed Sweetwater Vistas Homeowner's Association. Until the formation of the homeowner's association, Sweetwater Vistas, LLC or the current owner of the property will be responsible for maintenance. The required maintenance of the BMP is summarized in the table below.

TASK	FREQUENCY	INDICATOR MAINTENANCE IS NEEDED	MAINTENANCE NOTES
CATCHMENT INSPECTION	Weekly or Biweekly with routine property maintenance.	Excessive sediment, trash, and/or debris accumulation on the surface of bioretention	Permanently stabilize any exposed soil and remove any accumulated sediment. Adjacent pervious areas may need to be regraded.
INLET INSPECTION		Internal erosion or excessive sediment, trash, and/or debris accumulation	Check for sediment accumulation to ensure that flow into the bioretention is as designed. Remove any accumulated sediment.
LITTER/LEAF REMOVAL AND MISC. UPKEEP		Accumulation of litter and debris within bioretention area, mulch around outlet, internal erosion	Litter, leaves, and debris should be removed to reduce the risk of outlet clogging, reduce nutrient inputs to the bioretention area, and to improve facility aesthetics. Erosion should be repaired and stabilized.
PRUNING	1-2 times/year	Overgrown vegetation that interferes with access, lines of sight, or safety	Nutrients in runoff often cause bioretention vegetation to flourish.
MOWING	2-12 times/year	Overgrown vegetation that interferes with access, lines of sight, or safety	Frequency depends on location and desired aesthetic appeal and type of vegetation.
OUTLET INSPECTION	1 time/year	Erosion at outlet	Remove any accumulated mulch or sediment.
MULCH REMOVAL AND REPLACEMENT	1 time/2-3 years	2/3 of mulch has decomposed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches
REMOVE AND REPLACE DEAD PLANTS	1 time/year	Dead plants	Within the first year, 10 percent of plants can die. Survival rates increase with time.
TEMPORARY WATERING	1 time/2-3 days for first 2-3 months	Until establishment and during severely-droughty weather	Watering after the initial year might be required.

TASK	FREQUENCY	INDICATOR MAINTENANCE IS NEEDED	MAINTENANCE NOTES
FERTILIZATION	1 time initially	Upon planting	One-time spot fertilization for first year vegetation.

ATTACHMENT 4

County of San Diego PDP Structural BMP Verification for Permitted Land Development Projects

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County of San Diego BMP Design Manual Verification Form	
Project Summary Information	
Project Name	Sweetwater Vistas
Record ID (e.g., grading/improvement plan number)	TM-5608
Project Address	Sweetwater Springs Blvd and Jamacha Blvd Spring Valley, CA
Assessor's Parcel Number(s) (APN(s))	505-672-03 505-672-07 505-672-09 505-672-10 505-672-23 505-672-37
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Sweetwater 909 Jamacha Subarea 909.21
Responsible Party for Construction Phase	
Developer's Name	Terry Plowden - Sweetwater Vistas LLC, a Delaware Limited Liability Company. By: Douglas Wilson Companies, a California Corporation, it's manager
Address	1620 Fifth Avenue, Suite 400 San Diego, CA 92101
Email Address	tplowden@douglaswilson.com
Phone Number	619-906-4352
Engineer of Work	Robert A. Chase, RCE #41903, Exp. 3/31/18 Fuscoe Engineering, San Diego 92122
Engineer's Phone Number	858-554-1500
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	Terry Plowden - Sweetwater Vistas LLC, a Delaware Limited Liability Company. By: Douglas Wilson Companies, a California Corporation, it's manager.
Address	1620 Fifth Avenue, Suite 400 San Diego, CA 92101
Email Address	tplowden@douglaswilson.com
Phone Number	619-906-4352
*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.	

County of San Diego BMP Design Manual Verification Form Page 2 of 4

Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)

Description/Type of Structural BMP	Plan Sheet #	STRUCT-URAL BMP ID#	Maint-enance Category	Maintenance Agreement Recorded Doc #	Revisions
Biofiltration with Cistern	Preliminary Grading Plan Sheet 4	Biofiltration Basin 1.1-2 (with cistern)	2		
Biofiltration with Cistern	Preliminary Grading Plan Sheet 4	Biofiltration Basin 1.3 (with cistern)	2		
Biofiltration with Cistern	Preliminary Grading Plan Sheet 4	Biofiltration Basin 2 (with cistern)	2		
Biofiltration with Cistern	Preliminary Grading Plan Sheet 4	Biofiltration Basin 3 (with cisterns)	2		
Biofiltration with Cistern	Preliminary Grading Plan Sheet 4	Biofiltration Basin 4 (with cistern)	2		
Biofiltration	Preliminary Grading Plan Sheet 4	Biofiltration Basin	2		

*All Priority Development Projects (PDPs) require a Structural BMP					

Note: If this is a partial verification of Structural BMPs, provide a list and map denoting Structural BMPs that have already been submitted, those for this submission, and those anticipated in future submissions.

County of San Diego BMP Design Manual Verification Form Page 3 of 4

Checklist for Applicant to submit to PDCI:

- ☐ Copy of the final accepted SWQMP and any accepted addendum.
- ☐ Copy of the most current plan showing the Stormwater Structural BMP Table, plans/cross-section sheets of the Structural BMPs and the location of each verified as-built Structural BMP.
- ☐ Photograph of each Structural BMP.
- ☐ Photograph(s) of each Structural BMP during the construction process to illustrate proper construction.
- ☐ Copy of the approved Structural BMP maintenance agreement and associated security

By signing below, I certify that the Structural BMP(s) for this project have been constructed and all BMPs are in substantial conformance with the approved plans and applicable regulations. I understand the County reserves the right to inspect the above BMPs to verify compliance with the approved plans and Watershed Protection Ordinance (WPO). Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Please sign your name and seal.

[SEAL]

Professional Engineer's Printed Name:

____

Professional Engineer's Signed Name:

____

Date:____________________________________

County of San Diego BMP Design Manual Verification Form Page 4 of 4

COUNTY - OFFICIAL USE ONLY:

For PDCI: Verification Package #: ___________

PDCI Inspector: ____

Date Project has/expects to close: ____

Date verification received from EOW: _____________________________________

By signing below, PDCI Inspector concurs that every noted Structural BMP has been installed per plan.

PDCI Inspector's Signature: _________________________________ Date: ___________________

FOR WPP:

Date Received from PDCI: ____

WPP Submittal Reviewer: ____

WPP Reviewer concurs that the information provided for the following Structural BMPs is acceptable to enter into the Structural BMP Maintenance verification inventory:

List **acceptable** Structural BMPs:

WPP Reviewer's Signature: ________________________________ Date: ___________________

ATTACHMENT 5

Copy of Plan Sheets Showing Permanent Storm Water BMPs, Source Control, and Site Design

This is the cover sheet for Attachment 5.

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☒ Structural BMP(s) with ID numbers matching Step 6 Summary of PDP Structural BMPs
☒ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒ Details and specifications for construction of structural BMP(s)
☒ Signage indicating the location and boundary of structural BMP(s) as required by County staff
☒ How to access the structural BMP(s) to inspect and perform maintenance
☒ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☒ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☒ Recommended equipment to perform maintenance
☒ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☒ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☒ All BMPs must be fully dimensioned on the plans
☒ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number must be provided. Photocopies of general brochures are not acceptable.
☒ Include all source control and site design measures described in Steps 4 and 5 of the SWQMP. Can be included as a separate exhibit as necessary.

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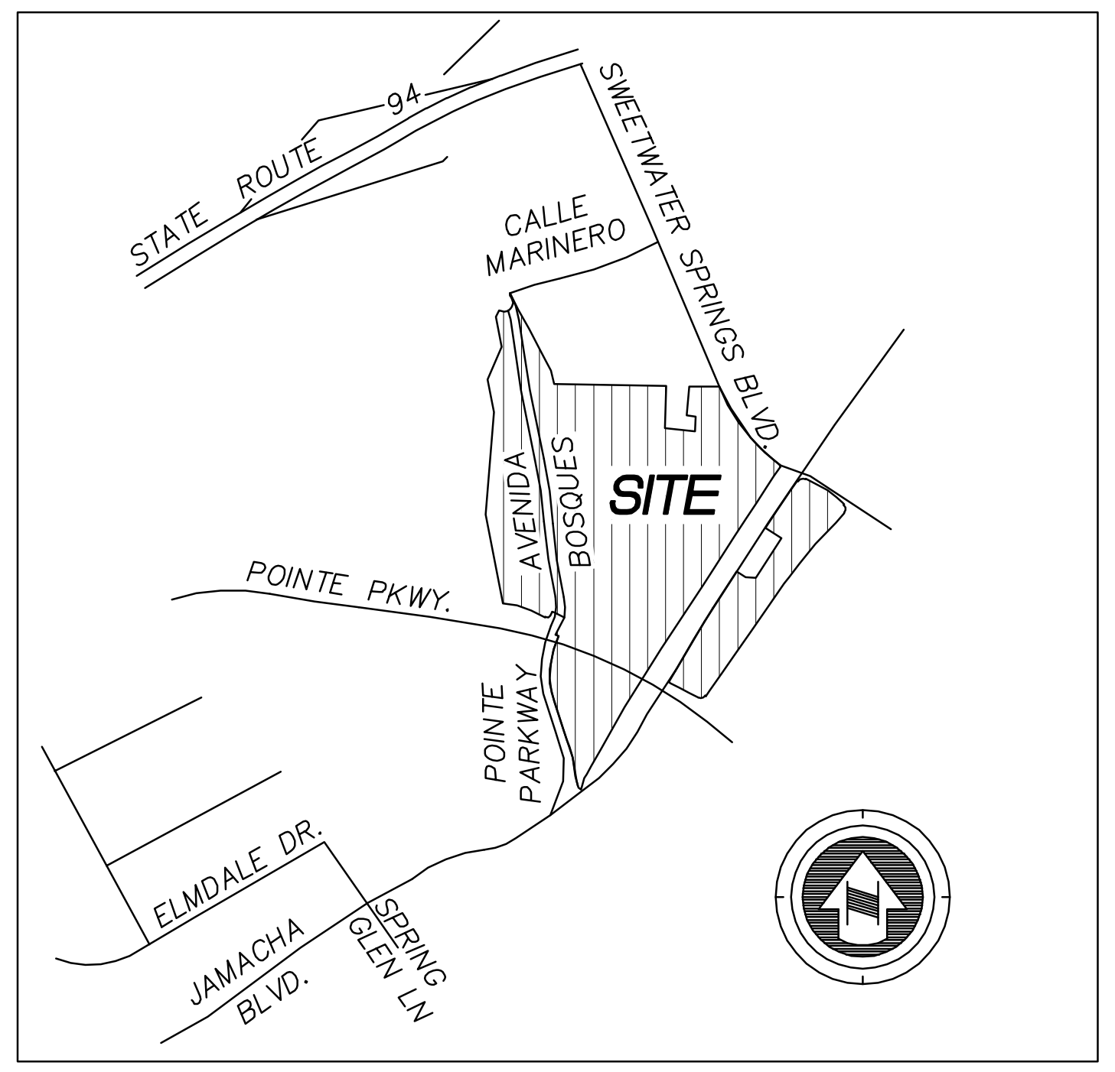
COUNTY OF SAN DIEGO TRACT TM 5608
PRELIMINARY GRADING PLAN
SWEETWATER VISTAS

INDEX MAP
SCALE: 1"=200'



THOMAS BROS PG 1291-E1

VICINITY MAP
NO SCALE

TOPOGRAPHY

AERIAL TOPOGRAPHY BY:
ROBERT J. LUNG & ASSOCIATES
2832 WALNUT AVENUE,SUITE E
TUSTIN, CA 92780
(714)832-2077
FLIGHT DATE: 09-02-2014

PROPOSED GRADING

CUT: 129,000 CY
FILL: 129,000 CY
ENGINEER'S ESTIMATE ONLY, NOT FOR BID PURPOSES

PROPOSED IMPROVEMENTS

PROPOSED IMPROVEMENTS INCLUDE THE CONSTUCTION OF PUBLIC SEWER, WATER AND STORM DRAIN SYSTEMS, AND A PUBLIC ROAD AS INDICATED ON THESE PLANS.

OWNER/APPLICANT

SWEETWATER VISTAS LLC
1620 FIFTH AVENUE, SUITE 400
SAN DIEGO, CALIFORNIA 92101
(619)906-4352

ENGINEER

FUSCOE ENGINEERING SAN DIEGO, INC. 6390
GREENWICH DRIVE, STE. 170
SAN DIEGO, CA 92122
(858)554-1500

LEGAL DESCRIPTION

PORTIONS OF SECTIONS 11, 12, 13, 14, 24, AND 25, TOWNSHIP ELEVEN SOUTH, RANGE 3 WEST, SBM TOGETHER WITH PORTIONS OF SECTIONS 18, 19, AND 30, TOWNSHIP ELEVEN SOUTH, RANGE 2 WEST, SBM IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

SOLAR ACCESS NOTE

ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH FUTURE DWELLING UNIT/COMMERCIAL UNIT ALLOWED BY THIS SUBDIVISION.

SPECIAL ASSESSMENT ACT STATEMENT:

THE SUBDIVIDER MAY MAKE A REQUEST TO THE BOARD OF SUPERVISORS FOR PERMISSION TO INITIATE PROCEEDINGS UNDER A SPECIAL ASSESSMENT ACT FOR CONSTRUCTION OF MAJOR UTILITY AND TRANSPORTATION INFRASTRUCTURE.

STREET LIGHT STATEMENT:

THE REQUIRED LIGHTING SYSTEM SHALL BE INSTALLED ACCORDING TO COUNTY ROAD STANDARDS. THE PUBLIC WORKS DEPARTMENT SHALL ADMINISTER THE COMPLIANCE PROCEDURES TO ASSURE PROPER INSTALLATION AND CONTINUED OPERATION.

OUTDOOR LIGHTING STATEMENT:

PRIOR TO ISSUANCE OF BUILDING PERMIT AN OUTDOOR LIGHTING PLAN SHALL BE APPROVED.

PARK LAND DEDICATION STATEMENT:

THE SUBDIVIDER INTENDS TO COMPLY WITH THE PARK LANDS DEDICATION ORDINANCE BY THE PAYMENT OF FEES AS ALLOWED AND REQUIRED BY THE ORDINANCE.

CONDOMINIUM STATEMENT:

PORTIONS OF THIS MAP ARE A CONDOMINIUM PROJECT AS DEFINED BY SECTION 1350 OF THE STATE OF CALIFORNIA CIVIL CODES, THE MAXIMUM NUMBER OF CONDOMINIUM UNITS PROPOSED IS 218.

WATER AND SEWER

WATER:

OTAY MUNICIPAL WATER DISTRICT
2554 SWEETWATER SPRINGS BLVD.
SPRING VALLEY, CA 91978
(619)670-2222

SEWER:

COUNTY OF SAN DIEGO SANITATION DISTRICT
5500 OVERLAND AVENUE SUITE 315
SAN DIEGO, CA 92123
(858)514-4900

SCHOOL DISTRICTS

LA MESA-SPRING VALLEY
SCHOOL DISTRICT
4750 DATE AVENUE
LA MESA, CA 91942
(619)668-5700

GROSSMONT UNION
HIGH SCHOOL DISTRICT
PO BOX 1043
LA MESA, CA 91944
(619)644-8000

FIRE DISTRICT

SAN MIGUEL FIRE PROTECTION DISTRICT
2850 VIA ORANGE WAY
SPRING VALLEY, CA 91978
(619)670-0500

EXISTING ZONING

SEE SHEET 2 FOR TABULATION OF EXISTING ZONING FOR EXISTING PARCELS.

PROPOSED ZONING

SEE SHEET 2 FOR TABULATION OF PROPOSED ZONING.

GROSS/NET AREA

52.0 ACRES

NUMBER OF LOTS

MULTIFAMILY RESIDENTIAL	3
OPEN SPACE	4

OWNER/DEVELOPER

SWEETWATER VISTAS LLC,
A DELAWARE LIMITED LIABILITY COMPANY,
BY: DOUGLAS WILSON COMPANIES,
A CALIFORNIA CORPORATION,
ITS MANAGER
1620 FIFTH AVENUE, SUITE 400
SAN DIEGO, CALIFORNIA 92101
(619)906-4352

Terry R. Plowden

TERRY R. PLOWDEN
SENIOR MANAGING DIRECTOR

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE:
3883 RUFFIN ROAD
SAN DIEGO CA 92123
(858) 636-3160
AskR5@wildlife.ca.gov
http://www.dfg.ca.gov/

LEGEND

ITEMS	STD. DWGS.	SYMBOL
* WATER	(W - 21)	— — v— — — v— —
FIRE HYDRANT	(W - 10)	—— — v— ——⧗
* SEWER	(S - 4)	—— — ss — ——
SEWER MANHOLE	(S - 2)	○
STORM DRAIN	(D - 60)	—— — SD — ——
CURB INLET	(D - 2)	◻
STORM DRAIN CLEANOUT	(D - 9)	◙
HEADWALL	(D - 34, D - 35)	〉
PROPOSED GREEN STREET TREE WELL	(GS-1.2)	⊠ ⊠
STREET LIGHT	(E - 1)	○—∘
STREET SECTION		Ⓙ/2 ——▲
TRACT BOUNDARY		—— - - —— - - ——
EASEMENT		— — — —
RESIDENTIAL LOT		***LOT 1***
OPEN SPACE LOT		***LOT A***
LOT LINE		━━━━━
PHASE BOUNDARY		▬ ▬ ▬ ▬
BRUSH MANAGEMENT EASEMENT		— — — — — — —
6" CONC. CURB & GUTTER	(G - 2)	═════
TYPE C RETAINING WALL	(C - 3)	▬▭▬▭▬▭▬
TRAIL		┼┼┼┼┼┼┼┼┼┼
PATHWAY		••••••••••••

NOTE:

SAN DIEGO COUNTY DESIGN STANDARDS DS-1 THROUGH DS-16, DS-20A AND DS-20B APPLY TO THIS PROJECT.

* SEWER- ALL PIPELINES ARE RECOMMENDED AS 8-INCH UNLESS OTHERWISE NOTED.

* WATER- ALL PIPELINES ARE RECOMMENDED AS 8-INCH UNLESS OTHERWISE NOTED.

MINIMUM PROPOSED LOT SIZE: 6,000 s.f.

TOTAL NUMBER OF DWELLING UNITS: 218

DESIGN STANDARDS:

1. STANDARDS FOR PUBLIC ROADWAY DESIGN WITHIN THIS PROJECT SHALL CONFORM WITH THE COUNTY OF SAN DIEGO PUBLIC ROAD STANDARDS.

2. STANDARDS FOR PUBLIC ROADWAY CROSS SECTIONS WITHIN THIS PROJECT SHALL COMPLY WITH THE TYPICAL SECTIONS SHOWN ON SHEET 2 OF THIS MAP. ELEMENTS SUCH AS PAVEMENT WIDTH, MEDIAN WIDTH, MEDIAN CURBING, CROSS FALL, SIDEWALK WIDTH AND LOCATION MAY VARY FROM THE COUNTY OF SAN DIEGO PUBLIC ROAD STANDARDS.

PERMITTING NOTE:

THE SUBJECT PROPERTY CONTAINS WETLANDS, A LAKE, STREAM AND OR WATERS OF THE US AND/OR STATE WHICH MAY BE SUBJECT TO REGULATION BY STATE AND/OR FEDERAL AGENCIES, INCLUDING BUT NOT LIMITED TO, THE REGIONAL WATER QUALITY CONTROL BOARD, U.S. ARMY CORPS OF ENGINEERS AND THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE. IT IS THE APPLICANT'S RESPONSIBILITY TO CONSULT WITH EACH AGENCY TO DETERMINE IF A PERMIT, AGREEMENT OR OTHER APPROVAL IS REQUIRED AND TO OBTAIN ALL NECESSARY PERMITS, AGREEMENTS OR APPROVALS BEFORE COMMENCING ANY ACTIVITY WHICH COULD IMPACT THE WETLANDS, LAKE, STREAM AND/OR WATERS OF THE US ON THE SUBJECT PROPERTY. THE AGENCY CONTACT INFORMATION IS PROVIDED BELOW:

U.S. ARMY CORPS OF ENGINEERS:
915 WILSHIRE BLVD., SUITE 1101
LOS ANGELES CA 90017
(213) 452-3333
http://www.usace.army.mil/

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE:
3883 RUFFIN ROAD
SAN DIEGO CA 92123
(858) 636-3160
AskR5@wildlife.ca.gov
http://www.dfg.ca.gov/

REGIONAL WATER QUALITY CONTROL BOARD:
2375 NORTHSIDE DRIVE, SUITE 100
SAN DIEGO CA 92108
RB9_DredgeFill@waterboards.ca.us
http://www.waterboards.ca.gov/sandiego/

ASSESSOR'S PARCEL NUMBERS:	GENERAL PLAN / REGIONAL CATEGORY	COMMUNITY PLAN	TAX RATE
505-672-03, 505-672-07, 505-672-09, 505-672-10, 505-672-23, 505-672-37	*SPECIFIC PLAN AREA/VILLAGE*	*SPRING VALLEY*	*83213*

SHEET INDEX

ENGINEER OF WORK

FUSCOE ENGINEERING
6390 GREENWICH DRIVE, STE. 170
SAN DIEGO, CA 92122
(858)554-1500

ROBERT A. CHASE
No. RCE 41903
EXP. 03-31-18
Civil

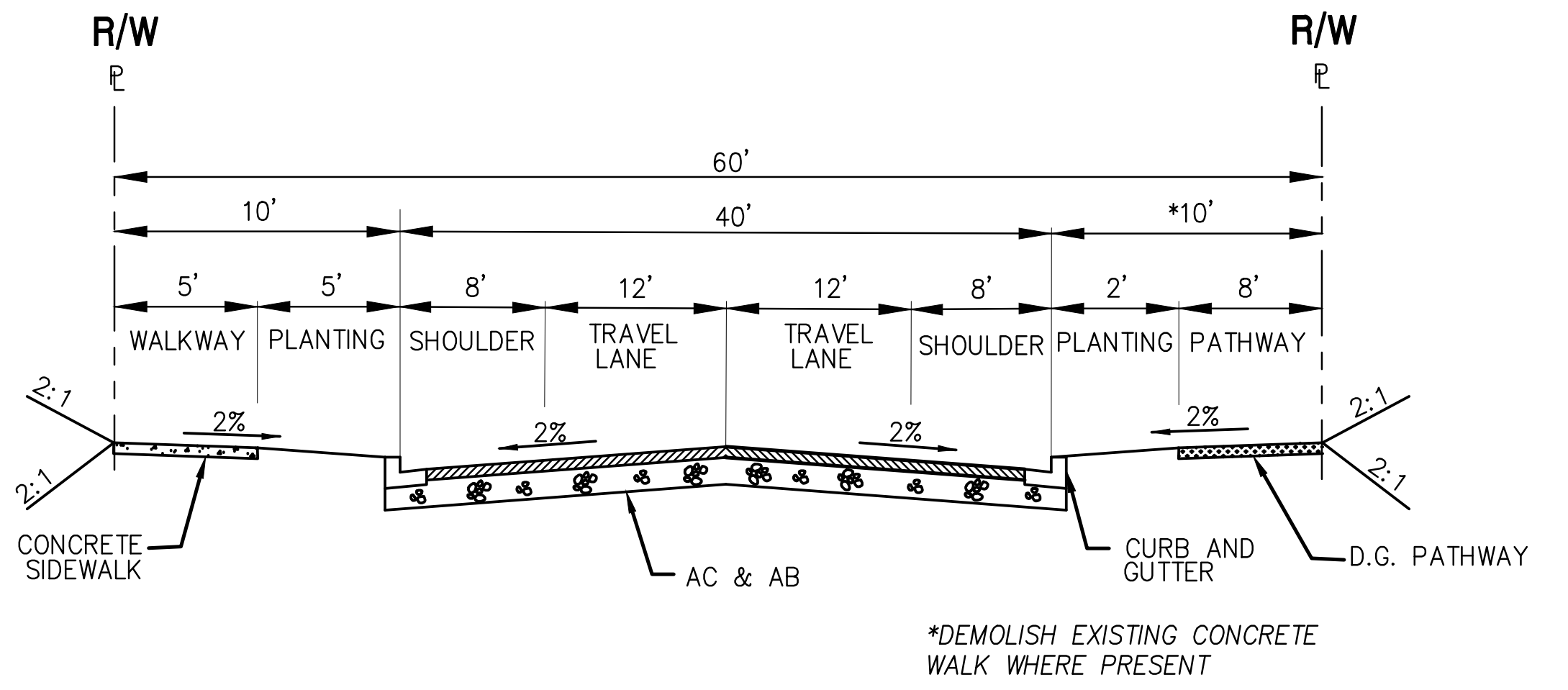
ROBERT A. CHASE *RCE 41903* *DATE*

SHEET 1 OF 4

NO.	DATE	REVISION

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

COUNTY OF SAN DIEGO TRACT TM 5608
PRELIMINARY GRADING PLAN
SWEETWATER VISTAS

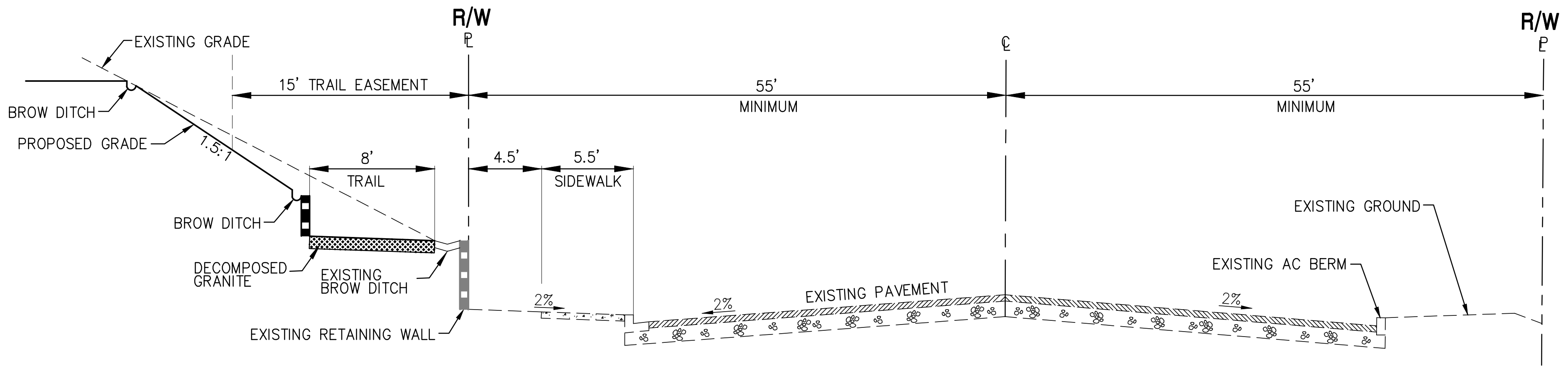


A/2 PROPOSED PUBLIC STREET SECTION FOR :

AVENIDA BOSQUES

(RESIDENTIAL COLLECTOR)

NO SCALE

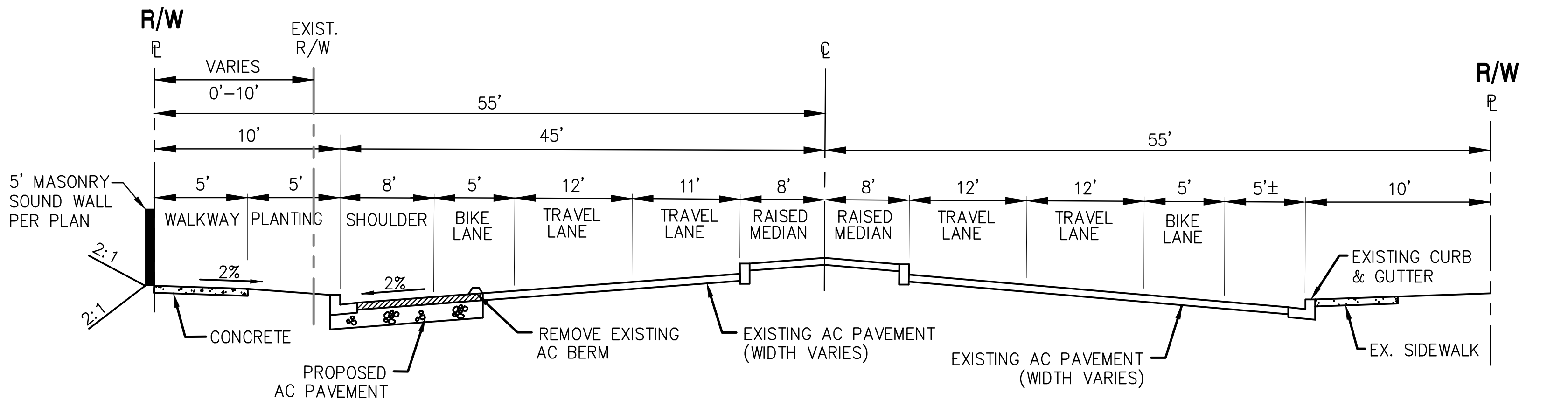


B/2 TYPICAL SECTION:

JAMACHA BOULEVARD

(MAJOR ROAD 4.1A)

NO SCALE

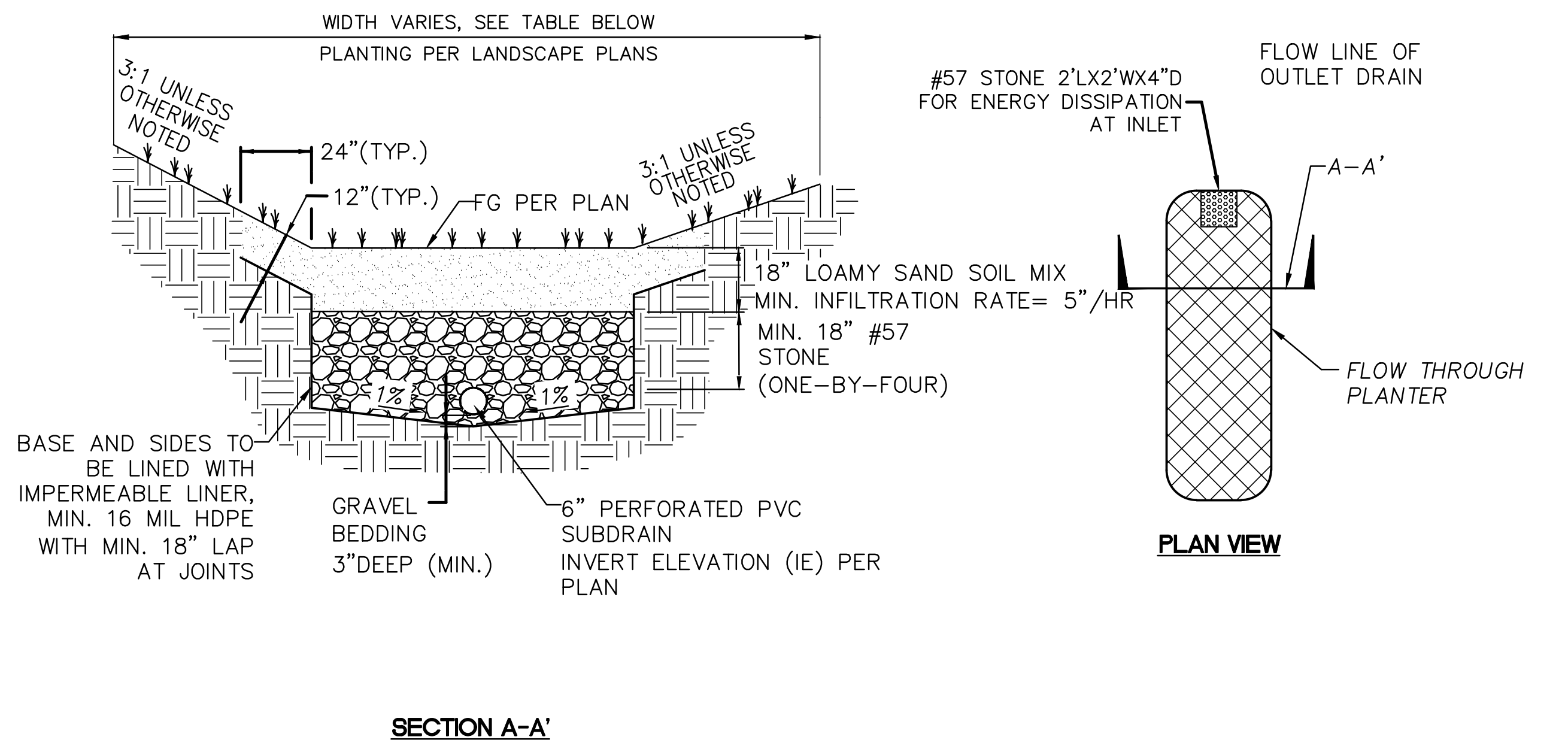


C/2 TYPICAL SECTION:

SWEETWATER SPRINGS BOULEVARD

(MAJOR ROAD 4.1A)

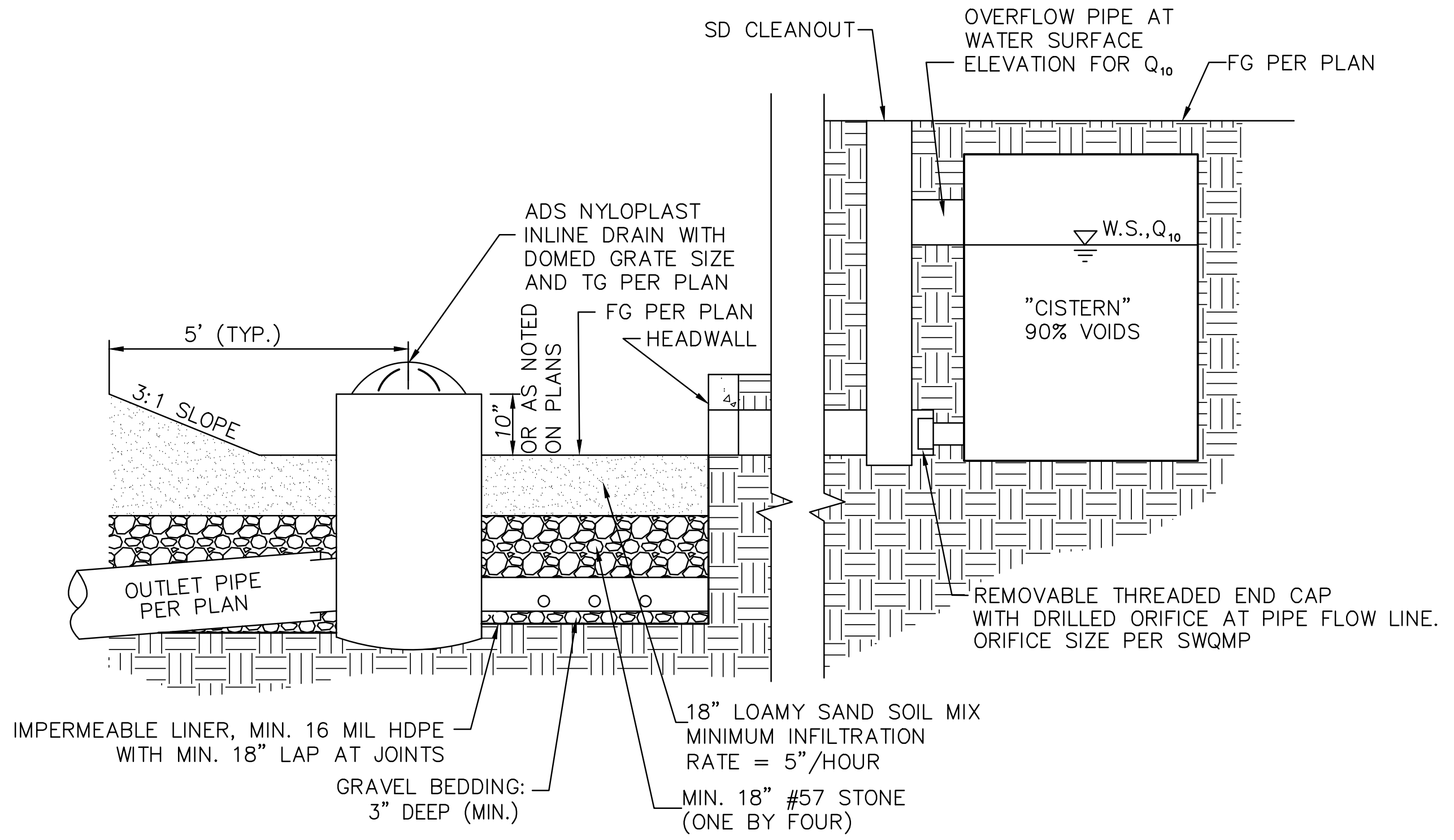
NO SCALE



D/2 TYPICAL SECTION:

BIO-FILTRATION BASIN

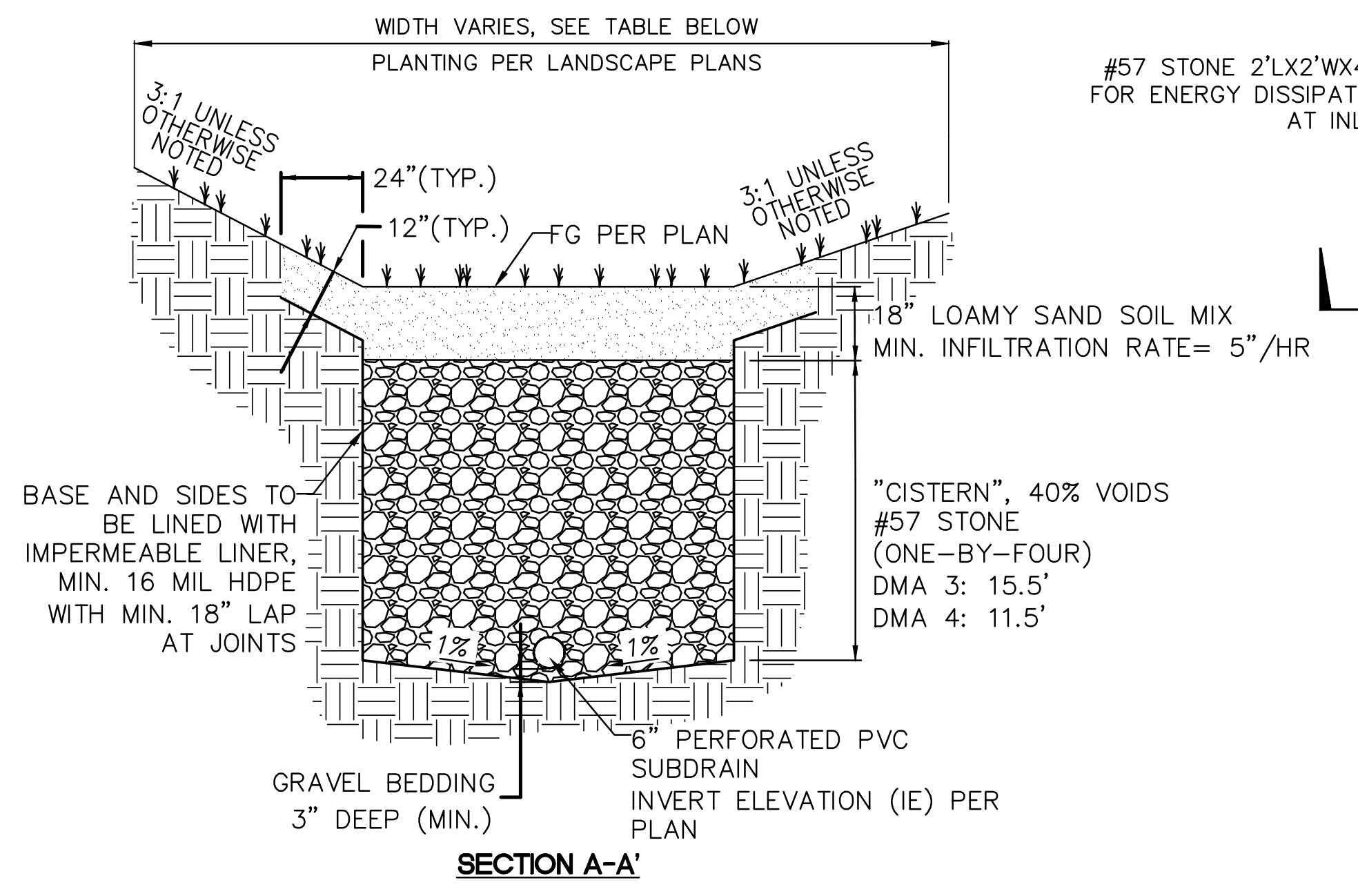
DMA 1.1, 1.2, 1.3, 2 NO SCALE



E/2 TYPICAL SECTION:

BIO-FILTRATION OUTLET STRUCTURE

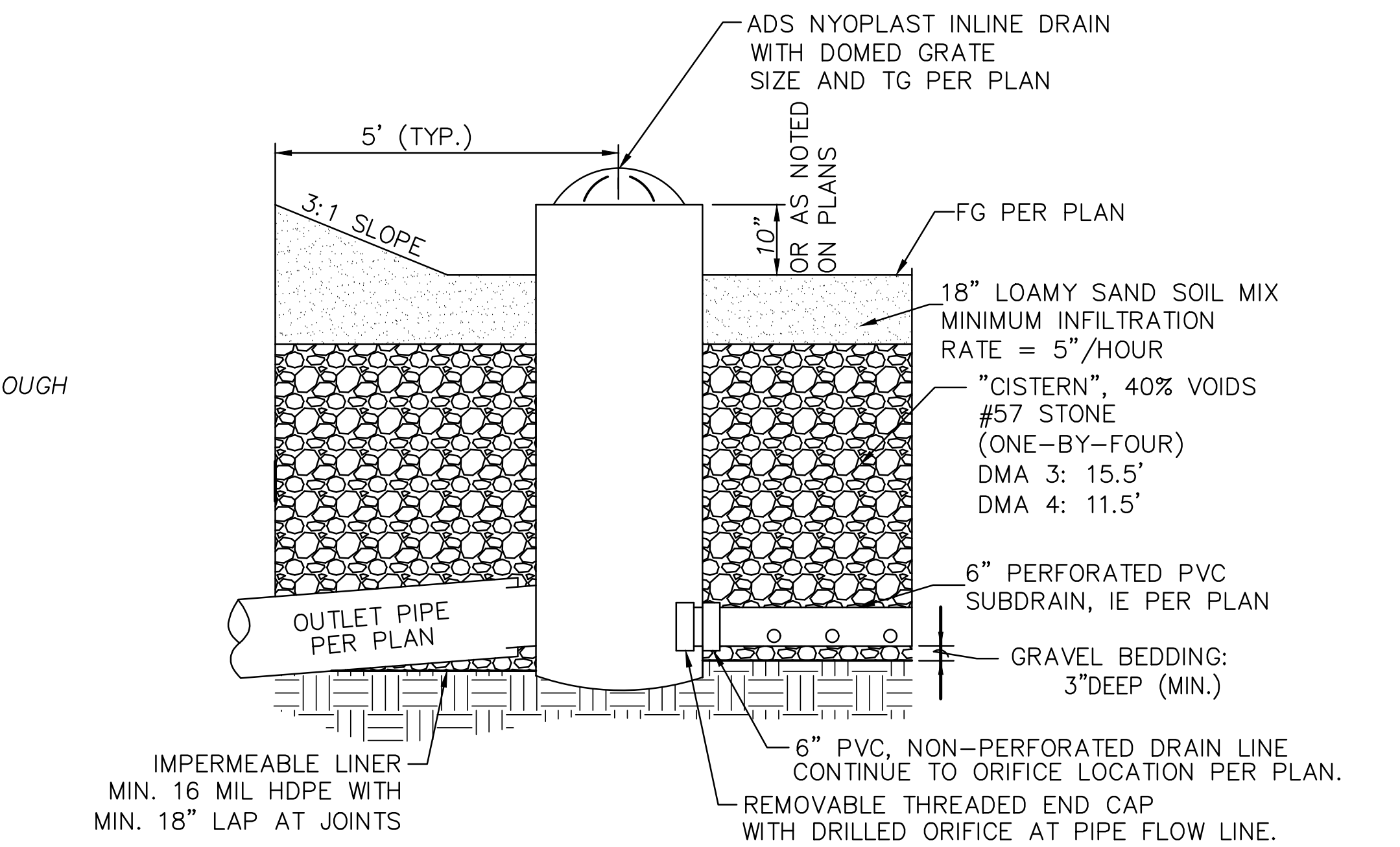
DMA 1.1, 1.2, 1.3, 2 NO SCALE



F/2 TYPICAL SECTION:

BIO-FILTRATION BASIN

DMA 3, 4 NO SCALE



G/2 TYPICAL SECTION:

BIO-FILTRATION OUTLET STRUCTURE

DMA 3, 4 NO SCALE

EXISTING ZONING:

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

505-672-03

COMMUNITY PLAN SPRING VALLEY

GENERAL PLAN DESIGNATION SPECIFIC PLAN AREA

REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		S80,S88
ANIMAL REGULATIONS		F,Q
DEVELOPMENT REGULATIONS	DENSITY	–
	MINIMUM LOT SIZE	–,1AC
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–
	BUILDING TYPE	X
	HEIGHT	C,Q
	SETBACK	V
	LOT COVERAGE	–
	OPEN SPACE	–,A
SPECIAL AREA REGULATIONS		–

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

APN 505-672-07

COMMUNITY PLAN SPRING VALLEY

GENERAL PLAN DESIGNATION SPECIFIC PLAN AREA

REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		C30,S80, S88
ANIMAL REGULATIONS		A,F,Q
DEVELOPMENT REGULATIONS	DENSITY	–
	MINIMUM LOT SIZE	–,1AC
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–,1
	BUILDING TYPE	X
	HEIGHT	A,G,C
	SETBACK	V
	LOT COVERAGE	–,0.75
	OPEN SPACE	–,A
SPECIAL AREA REGULATIONS		–,D

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

APN 505-672-09, 505-672-10

COMMUNITY PLAN SPRING VALLEY

GENERAL PLAN DESIGNATION SPECIFIC PLAN AREA

REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		C30
ANIMAL REGULATIONS		A
DEVELOPMENT REGULATIONS	DENSITY	–
	MINIMUM LOT SIZE	–
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	1.00
	BUILDING TYPE	X
	HEIGHT	G
	SETBACK	V
	LOT COVERAGE	0.75
	OPEN SPACE	–
SPECIAL AREA REGULATIONS		D

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

APN 505-672-23

COMMUNITY PLAN SPRING VALLEY

GENERAL PLAN DESIGNATION SPECIFIC PLAN AREA

REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		RS,S88
ANIMAL REGULATIONS		B,F
DEVELOPMENT REGULATIONS	DENSITY	–
	MINIMUM LOT SIZE	1AC,3000
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–
	BUILDING TYPE	D,X
	HEIGHT	G,Q
	SETBACK	V
	LOT COVERAGE	–,0.60
	OPEN SPACE	A
SPECIAL AREA REGULATIONS		–,P

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

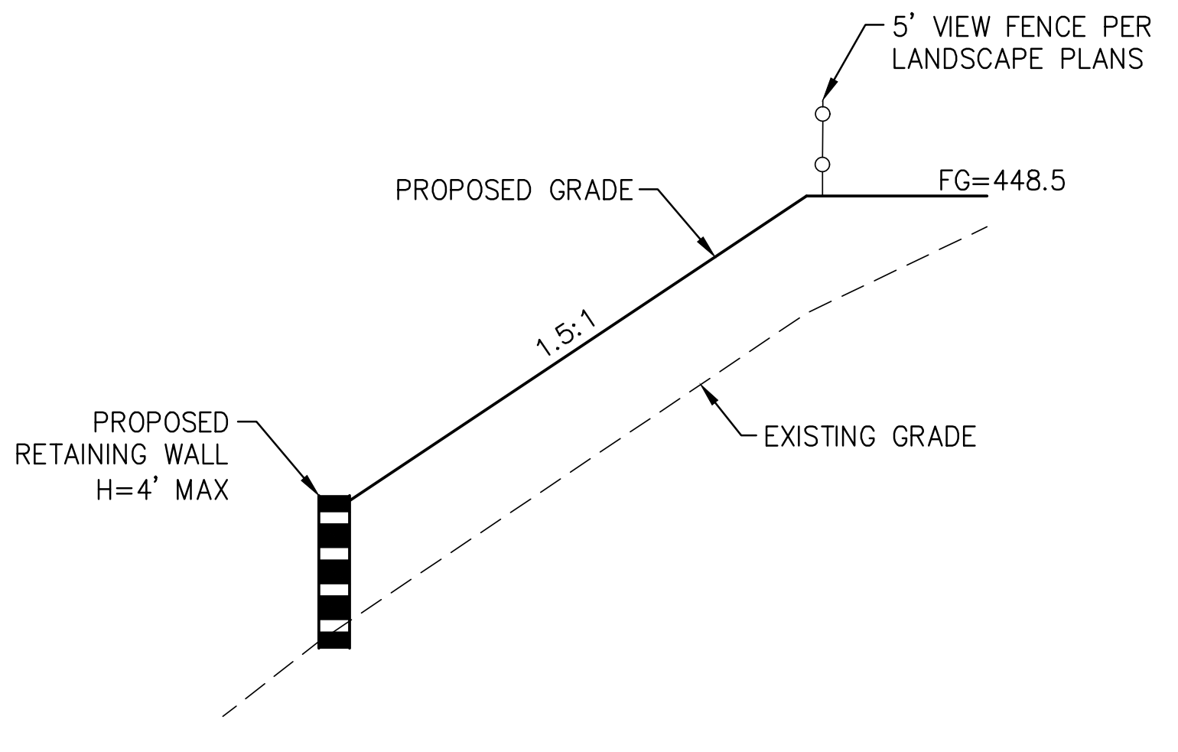
APN 505-672-37

COMMUNITY PLAN SPRING VALLEY

GENERAL PLAN DESIGNATION SPECIFIC PLAN AREA

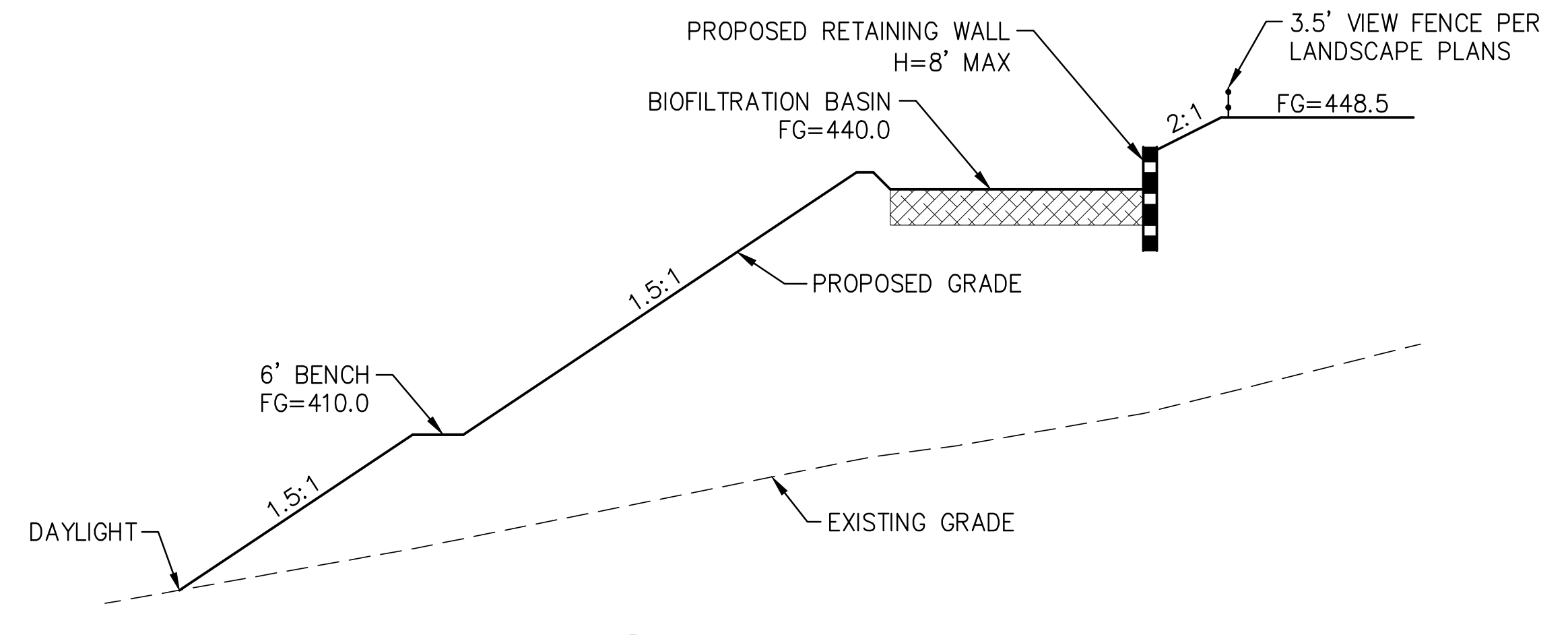
REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		S88
ANIMAL REGULATIONS		F
DEVELOPMENT REGULATIONS	DENSITY	–
	MINIMUM LOT SIZE	1AC
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–
	BUILDING TYPE	X
	HEIGHT	Q
	SETBACK	V
	LOT COVERAGE	–
	OPEN SPACE	A
SPECIAL AREA REGULATIONS		–



H/2 TYPICAL SECTION:

NO SCALE



I/2 TYPICAL SECTION:

NO SCALE

PROPOSED ZONING:

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

APN 505-672-03,-07,-09,-10,-23,-37

COMMUNITY PLAN SPRING VALLEY

GENERAL PLAN DESIGNATION OPEN SPACE-CONSERVATION

REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		S80
ANIMAL REGULATIONS		A
DEVELOPMENT REGULATIONS	DENSITY	–
	LOT SIZE	–
	BUILDING TYPE	–
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–
	HEIGHT	–
	LOT COVERAGE	–
	SETBACK	–
	OPEN SPACE	–
SPECIAL AREA REGULATIONS		–

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE
ZONING INFORMATION

APN 505-672-03,-23

COMMUNITY PLAN SPRING VALLEY

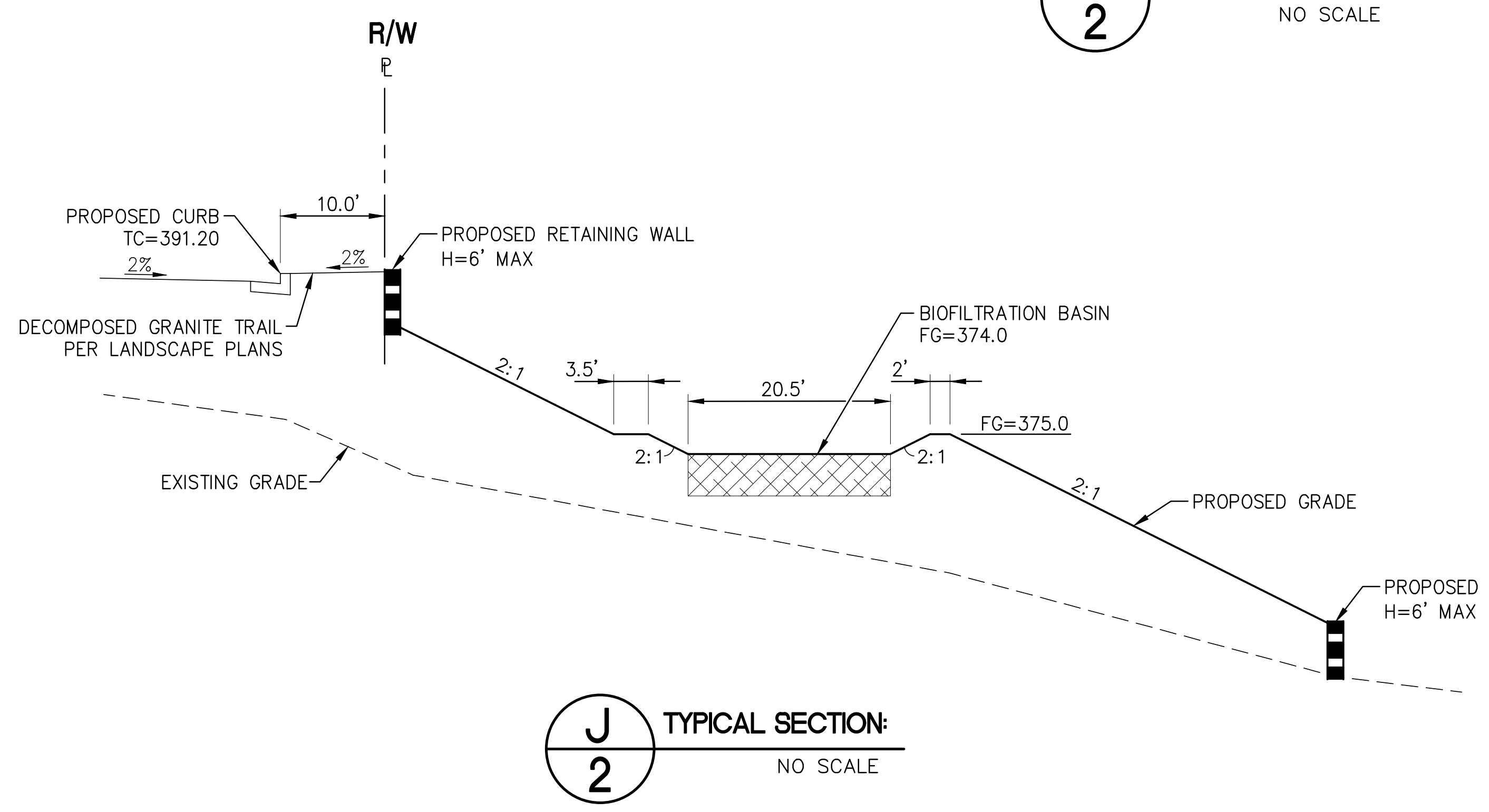
GENERAL PLAN DESIGNATION VILLAGE RESIDENTIAL 15

REGIONAL CATEGORY VILLAGE

ZONE		
USE REGULATIONS		RU
ANIMAL REGULATIONS		A
DEVELOPMENT REGULATIONS	DENSITY	–
	LOT SIZE	6,000
	BUILDING TYPE	K
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–
	HEIGHT	H
	LOT COVERAGE	–
	SETBACK	V
	OPEN SPACE	A
SPECIAL AREA REGULATIONS		B

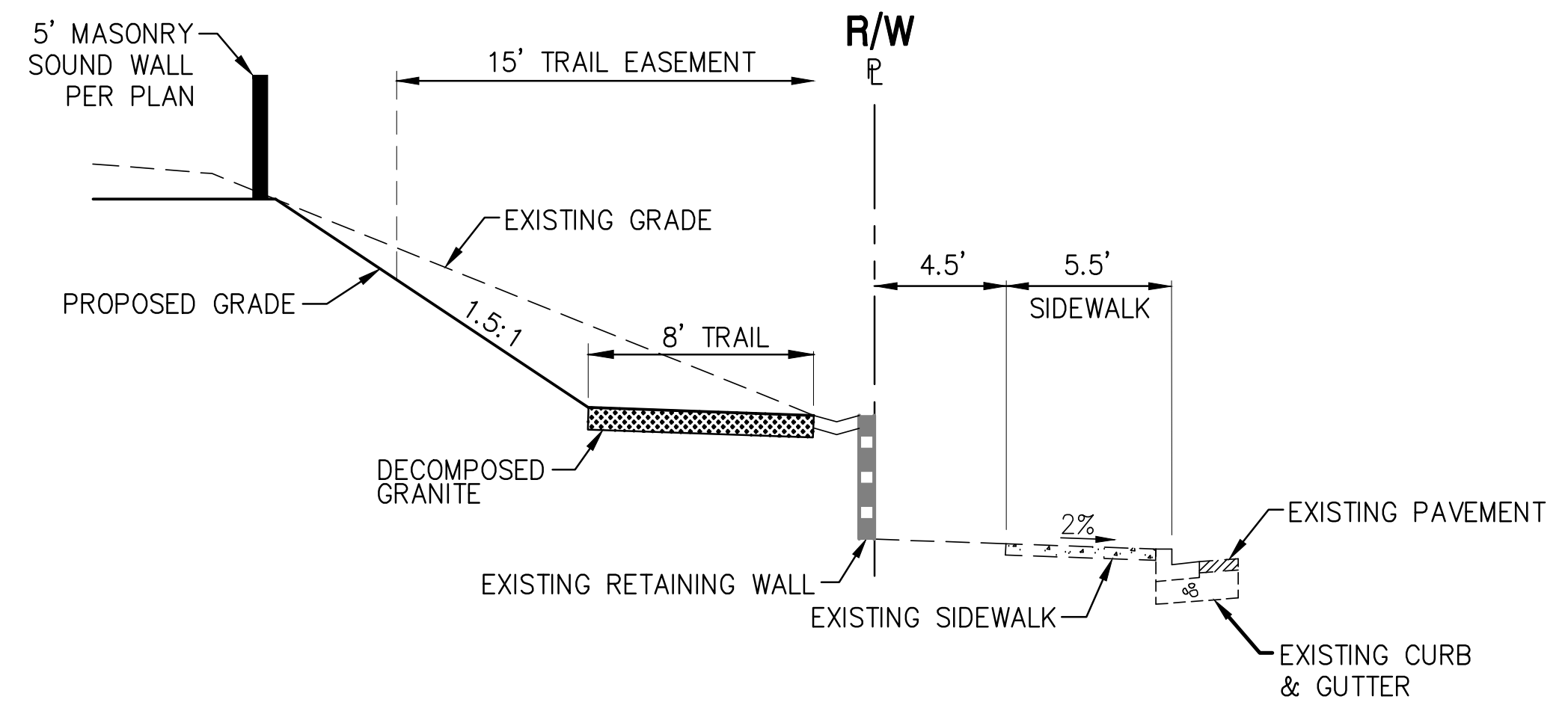
STREET LANDSCAPING STANDARDS:

1. STREET LANDSCAPING SHALL CONFORM WITH THE COUNTY OF SAN DIEGO'S LANDSCAPE GUIDELINES.
2. FINAL LANDSCAPE PLACEMENT SHALL BE SUBJECT TO APPROVAL OF "CLEAR ZONE" SPACING AT THE TIME OF IMPROVEMENT PLAN REVIEW.
3. LANDSCAPE MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE PROJECT.



J/2 TYPICAL SECTION:

NO SCALE



K/2 TYPICAL SECTION:

JAMACHA BOULEVARD

(MAJOR ROAD 4.1A)

NO SCALE

SHEET 2 OF 4

NO.	DATE	REVISION

ENGINEER OF WORK

FUSCOE ENGINEERING
6390 GREENWICH DRIVE, STE. 170
SAN DIEGO, CA 92122
(858)554-1500

ROBERT A. CHASE RCE 41903 DATE

ROBERT A. CHASE
No. RCE 41903
EXP. 03-31-18
Civil

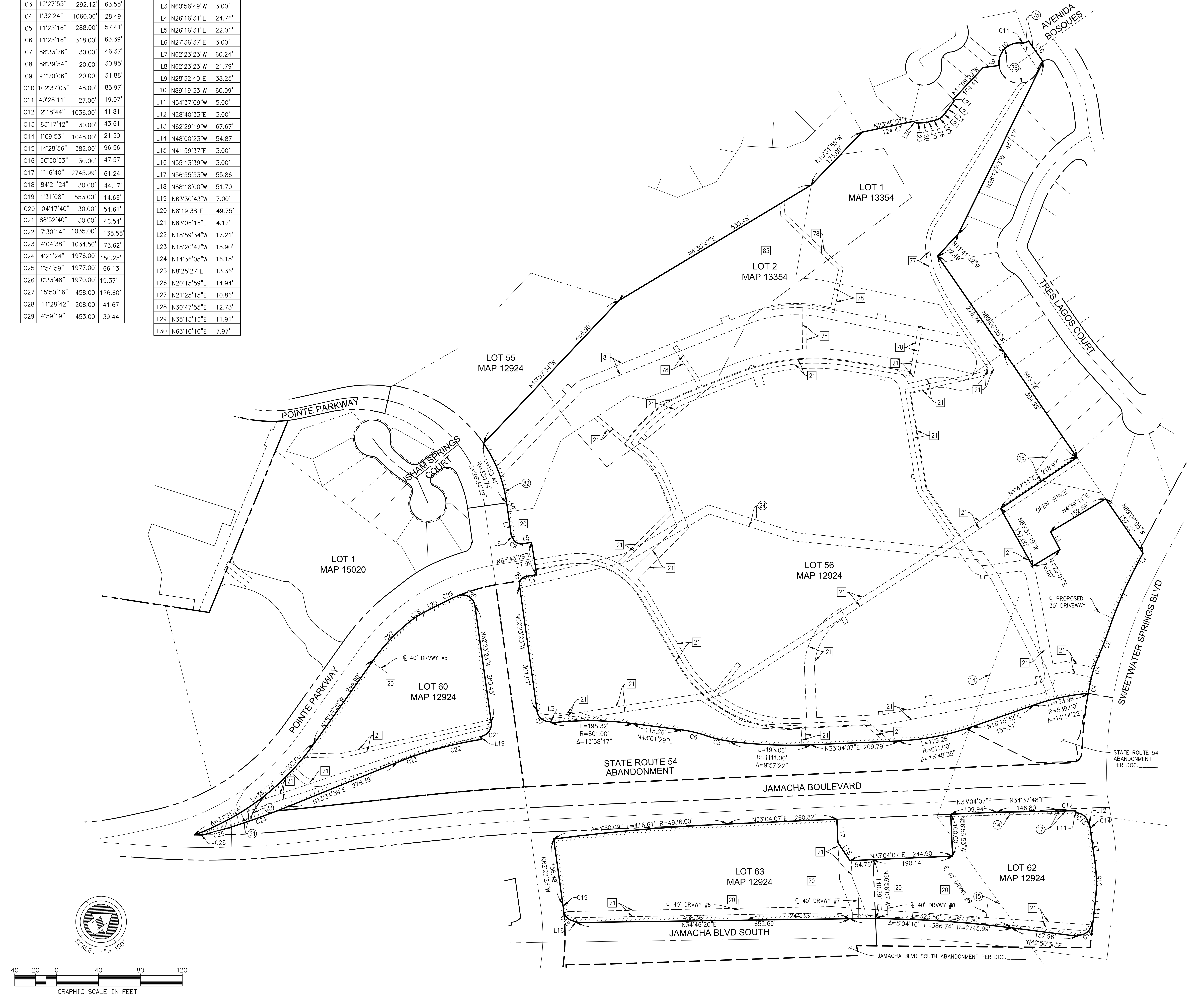
FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

F:\PROJECTS\2780\002\PLANS\PRELIMINARY GRADING\2780-002-03PG02DT.DWG (03-14-17 8:59:12AM) Plotted by: mroberts

COUNTY OF SAN DIEGO TRACT TM 5608
PRELIMINARY GRADING PLAN
SWEETWATER VISTAS

CURVE TABLE			
NO.	DELTA	RADIUS	LENGTH
C1	9°46'59"	1050.00'	179.28'
C2	5°34'21"	653.64'	63.57'
C3	12°27'55"	292.12'	63.55'
C4	1°32'24"	1060.00'	28.49'
C5	11°25'16"	288.00'	57.41'
C6	11°25'16"	318.00'	63.39'
C7	88°33'26"	30.00'	46.37'
C8	88°39'54"	20.00'	30.95'
C9	91°20'06"	20.00'	31.88'
C10	102°37'03"	48.00'	85.97'
C11	40°28'11"	27.00'	19.07'
C12	2°18'44"	1036.00'	41.81'
C13	83°17'42"	30.00'	43.61'
C14	1°09'53"	1048.00'	21.30'
C15	14°28'56"	382.00'	96.56'
C16	90°50'53"	30.00'	47.57'
C17	1°16'40"	2745.99'	61.24'
C18	84°21'24"	30.00'	44.17'
C19	1°31'08"	553.00'	14.66'
C20	104°17'40"	30.00'	54.61'
C21	88°52'40"	30.00'	46.54'
C22	7°30'14"	1035.00'	135.55'
C23	4°04'38"	1034.50'	73.62'
C24	4°21'24"	1976.00'	150.25'
C25	1°54'59"	1977.00'	66.13'
C26	0°33'48"	1970.00'	19.37'
C27	15°50'16"	458.00'	126.60'
C28	11°28'42"	208.00'	41.67'
C29	4°59'19"	453.00'	39.44'

LINE TABLE		
NO.	BEARING	DISTANCE
L1	N81°49'49"W	48.00'
L2	N26°10'02"W	25.39'
L3	N60°56'49"W	3.00'
L4	N26°16'31"E	24.76'
L5	N26°16'31"E	22.01'
L6	N27°36'37"E	3.00'
L7	N62°23'23"W	60.24'
L8	N62°23'23"W	21.79'
L9	N28°32'40"E	38.25'
L10	N89°19'33"W	60.09'
L11	N54°37'09"W	5.00'
L12	N28°40'33"E	3.00'
L13	N62°29'19"W	67.67'
L14	N48°00'23"W	54.87'
L15	N41°59'37"E	3.00'
L16	N55°13'39"W	3.00'
L17	N56°55'53"W	55.86'
L18	N88°18'00"W	51.70'
L19	N63°30'43"W	7.00'
L20	N8°19'38"E	49.75'
L21	N83°06'16"E	4.12'
L22	N18°59'34"W	17.21'
L23	N18°20'42"W	15.90'
L24	N14°36'08"W	16.15'
L25	N8°25'27"E	13.36'
L26	N20°15'59"E	14.94'
L27	N21°25'15"E	10.86'
L28	N30°47'55"E	12.73'
L29	N35°13'16"E	11.91'
L30	N63°10'10"E	7.97'



EASEMENT NOTES:

⑭ AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED MAY 29, 1944 IN BOOK 1692, PAGE 52 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY
AFFECTS: LOT 62

⑮ AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED AUGUST 5, 1946 IN BOOK 2194, PAGE 324 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY
AFFECTS: LOT 62

⑯ AN EASEMENT FOR DRAINAGE CHANNEL AND INCIDENTAL PURPOSES, RECORDED JULY 30, 1975 AS INSTRUMENT NO. 75–199851 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
AFFECTS: LOT 56

⑰ AN EASEMENT FOR A PUBLIC HIGHWAY AND INCIDENTAL PURPOSES, RECORDED JULY 27, 1990 AS INSTRUMENT NO. 90–409447 OF OFFICIAL RECORDS.
IN FAVOR OF: THE COUNTY OF SAN DIEGO
AFFECTS: JAMACHA BOULEVARD LYING WITHIN LOT 62

㉓ AN EASEMENT FOR A PUBLIC HIGHWAY AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 25, 2005 AS INSTRUMENT NO. 2005–0155459 OF OFFICIAL RECORDS.
IN FAVOR OF: THE COUNTY OF SAN DIEGO, A POLITICAL SUBDIVISION
AFFECTS: LOT 60

㉔ AN EASEMENT FOR SEWER PIPE LINES AND/OR MAINS, MANHOLES, SEWER LATERAL PIPE LINES, AND ALL STRUCTURES AND INCIDENTAL PURPOSES, RECORDED MARCH 30, 2005 AS INSTRUMENT NO. 2005–0259477 OF OFFICIAL RECORDS.
IN FAVOR OF: SPRING VALLEY SANITATION DISTRICT
AFFECTS: LOT 56

(75) A 20 FOOT WIDE EASEMENT FOR CONSTRUCTION, INGRESS AND EGRESS, ROAD, PIPE LINES ALONG WITH NECESSARY FACILITIES SUCH AS POWER AND COMMUNICATION LINES AND ROAD DRAINAGE TO THE RESERVOIR, UNDERGROUND WATER PIPELINE, RESERVOIR DRAINAGE AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 20, 1973 AS INSTRUMENT NO. 73–043623 OF OFFICIAL RECORDS.
IN FAVOR OF: OTAY MUNICIPAL WATER DISTRICT, A BODY POLITICO
AFFECTS: PARCEL 2

NOTE: BY QUITCLAIM DEED FROM OTAY MUNICIPAL WATER DISTRICT, A MUNICIPAL WATER DISTRICT ORGANIZED UNDER THE MUNICIPAL WATER DISTRICT ACT OF 1911, AS AMENDED, HEREINAFTER REFERRED TO AS "GRANTOR", A CORPORATION, TO LEO R. B. HENRIKSON, TRUSTEE U.D.T. DATED JULY 9, 1971, RECORDED MARCH 15, 1977 AS INSTRUMENT NO. 77–094517 OF OFFICIAL RECORDS. A PORTION OF SAID EASEMENTS WERE REVISED. SAID DOCUMENT ALSO RESERVES VARIOUS LANDSCAPE, PIPELINE, ROADWAY, SLOPE AND DRAIN AND LANDSCAPE EASEMENTS.

(76) THE PRIVILEGE AND RIGHT TO EXTEND DRAINAGE STRUCTURES, EXCAVATION AND EMBANKMENT SLOPES BEYOND THE LIMITS OF AVENIDA BOZQUES WHERE REQUIRED FOR THE CONSTRUCTION AND MAINTENANCE OF SAID ROAD AS GRANTED TO THE COUNTY OF SAN DIEGO IN DEED RECORDED FEBRUARY 28, 1992 AS INSTRUMENT NO. 1992–0110876 OF OFFICIAL RECORDS.
(AFFECTS PARCEL 2)

(82) ABUTTER'S RIGHTS OF INGRESS AND EGRESS TO OR FROM POINTE PARKWAY EXCEPT AT ACCESS OPENING NO. 1 HAVE BEEN DEDICATED OR RELINQUISHED ON THE MAP OF MAP NO. 13354 OF TRACT MAPS RECORDED AUGUST 28, 1996.
(AFFECTS A PORTION OF PARCEL 3)

EASEMENTS TO BE QUITCLAIMED:

20 ABUTTER'S RIGHTS OF INGRESS AND EGRESS TO OR FROM LOTS 56, 60, 62 AND 63, INCLUSIVE IN AND TO STATE ROUTE 54, POINTE PARKWAY, GOLF POINTE DRIVE, JAMACHA BOULEVARD, JAMACHA BOULEVARD SOUTH, SPRING GLEN LANE AND SWEETWATER SPRINGS BOULEVARD EXCEPT AT ACCESS OPENING # 1–9, INCLUSIVE HAVE BEEN DEDICATED OR RELINQUISHED ON THE MAP OF MAP NO. 12924 OF TRACT MAPS RECORDED MARCH 04, 1992.

21 AN EASEMENT SHOWN OR DEDICATED ON THE MAP FILED OR RECORDED MARCH 04, 1992 AS MAP NO. 12924 OF TRACT MAPS. FOR: NOISE PROTECTION, WATER, SEWER, PEDESTRIAN, EQUESTRIAN TRAIL, PROPOSED PRIVATE ROAD TO LOT 57 AND 15 FOOT DRAINAGE EASEMENT DEDICATED HEREON TO THE SAN DIEGO COUNTY FLOOD CONTROL DISTRICT AND INCIDENTAL PURPOSES.

77 A 10 FOOT WIDE EASEMENT FOR AN ENCLOSED OR UNENCLOSED FLOOD DRAINAGE CHANNEL AND ALL STRUCTURES INCIDENTAL THERETO, AND FOR THE FLOWAGE OF ANY WATERS IN, OVER, UPON OR THROUGH SAID CHANNEL, TOGETHER WITH THE PERPETUAL RIGHT TO REMOVE BUILDINGS, STRUCTURES, TREES, BUSHES, UNDERGROWTH, AND ANY OTHER OBSTRUCTION INTERFERING WITH THE USE OF SAID EASEMENT AND RIGHT–OF–WAY AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 28, 1992 AS INSTRUMENT NO. 1992–0110877 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
AFFECTS: PARCEL 2

78 AN EASEMENT FOR SEWER PIPE LINES AND/OR MAINS, MANHOLES, SEWER LATERAL PIPE LINES AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 28, 1992 AS INSTRUMENT NO. 1992–0110877 OF OFFICIAL RECORDS.
IN FAVOR OF: SPRING VALLEY SANITATION DISTRICT
AFFECTS: AS DESCRIBED THEREIN

81 A 24 FOOT WIDE EASEMENT FOR UNDERGROUND WATER PIPELINES AND LATERALS, MAIN SEWER LINES, SEWER TRUNK LINES, COLLECTION LINES AND LATERALS, SEWER MANHOLES AND OTHER UNDERGROUND AND SURFACE STRUCTURES APPURTENANT TO SAID WATER AND SEWER LINES AND INCIDENTAL PURPOSES, RECORDED JUNE 3, 1996 AS INSTRUMENT NO. 1996–0277259 OF OFFICIAL RECORDS.
IN FAVOR OF: OTAY WATER DISTRICT
AFFECTS: AS DESCRIBED THEREIN

83 AN EASEMENT SHOWN OR DEDICATED ON THE MAP FILED OR RECORDED AUGUST 28, 1996 AS MAP NO. 13354 OF TRACT MAPS. FOR: NOISE PROTECTION AND INCIDENTAL PURPOSES.
(AFFECTS PARCEL 3)

ENGINEER OF WORK

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SAN DIEGO, CA 92122
(858)554–1500

ROBERT A. CHASE *RCE 41903* *DATE*

ROBERT A. CHASE
No. RCE 41903
EXP. 03–31–18
Civil

SHEET 3 OF 4

NO.	DATE	REVISION

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

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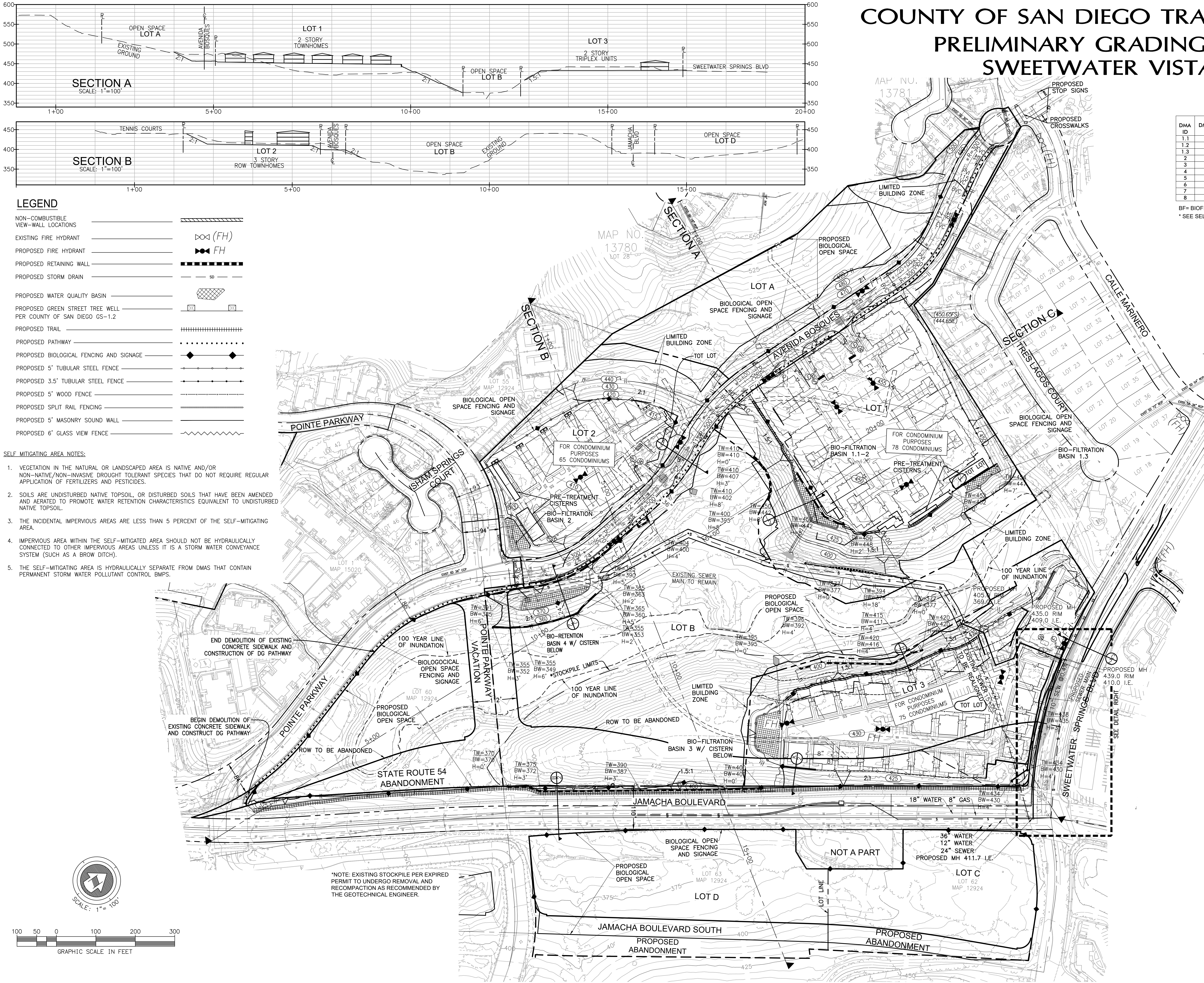
COUNTY OF SAN DIEGO TRACT TM 5608
PRELIMINARY GRADING PLAN
SWEETWATER VISTAS



LEGEND

NON-COMBUSTIBLE VIEW-WALL LOCATIONS	▨
EXISTING FIRE HYDRANT	⋈ (FH)
PROPOSED FIRE HYDRANT	⋈ FH
PROPOSED RETAINING WALL	▬
PROPOSED STORM DRAIN	— — SD — —
PROPOSED WATER QUALITY BASIN	▨
PROPOSED GREEN STREET TREE WELL PER COUNTY OF SAN DIEGO GS-1.2	☒ ☒
PROPOSED TRAIL	++++++++
PROPOSED PATHWAY	• • • • • •
PROPOSED BIOLOGICAL FENCING AND SIGNAGE	—◆—◆—
PROPOSED 5' TUBULAR STEEL FENCE	—○—○—○—
PROPOSED 3.5' TUBULAR STEEL FENCE	—●—●—●—
PROPOSED 5' WOOD FENCE	—x—x—x—
PROPOSED SPLIT RAIL FENCING	++++++++
PROPOSED 5' MASONRY SOUND WALL	—
PROPOSED 6' GLASS VIEW FENCE	∧∧∧∧∧

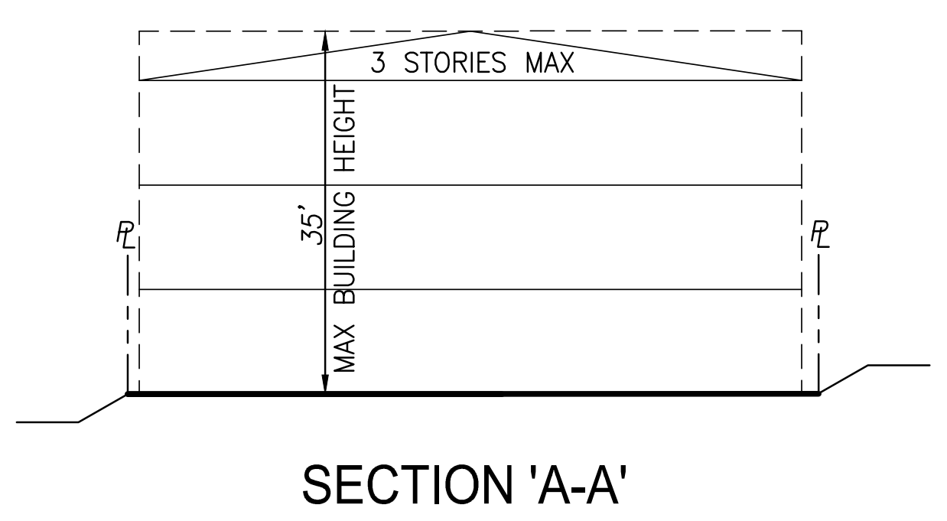
SELF MITIGATING AREA NOTES:

1. VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
2. SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
3. THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
4. IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
5. THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

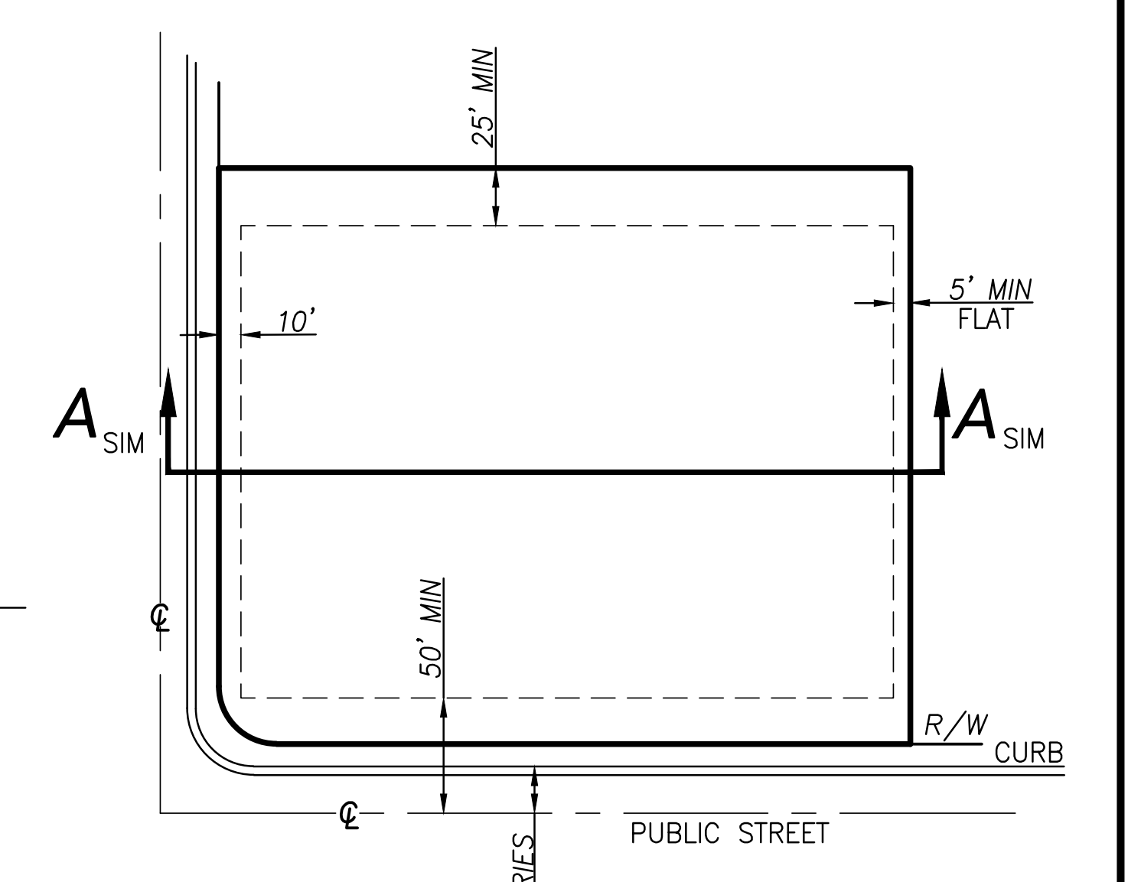
DMA ID	DMA AREAS (AC)	BMP ID	MAINT. CATEGORY	TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ'S	100-YEAR DETENTION	BIOFILTRATION BASIN AREA (SF) REQUIRED	BIOFILTRATION BASIN AREA (SF) PROVIDED	CISTERN VOLUME (CF) REQUIRED	CISTERN VOLUME (CF) PROVIDED
1.1	1.17	1.1-2	2-HOA	BF + CISTERN	YES	YES	804	1,085	9,095	11,160
1.2	2.11	1.1-2	2-HOA	BF + CISTERN	YES	YES	1,410	1,907	15,954	16,065
1.3	1.96	1.3	2-HOA	BF + CISTERN	YES	YES	1,260	1,720	12,980	14,250
2	3.26	2	2-HOA	BF + CISTERN	YES	YES	1,772	2,670	21,069	22,100
3	5.06	3	2-HOA	BF + CISTERN	YES	YES	3,230	6,000	35,104	37,200
4	3.61	4	2-HOA	BF + CISTERN	YES	YES	1,761	4,000	18,600	26,400
5	2.65	N/A	N/A	SELF MITIGATING*	YES	NO	N/A	N/A	N/A	N/A
6	0.59	N/A	N/A	SELF MITIGATING*	YES	NO	N/A	N/A	N/A	N/A
7	0.40	N/A	N/A	BF	YES	NO	2,229	2,233	N/A	N/A
8	0.60	N/A	N/A	SELF MITIGATING*	YES	NO	N/A	N/A	N/A	N/A

BF= BIOFILTRATION BASIN

* SEE SELF MITIGATING AREA NOTES ON LEFT

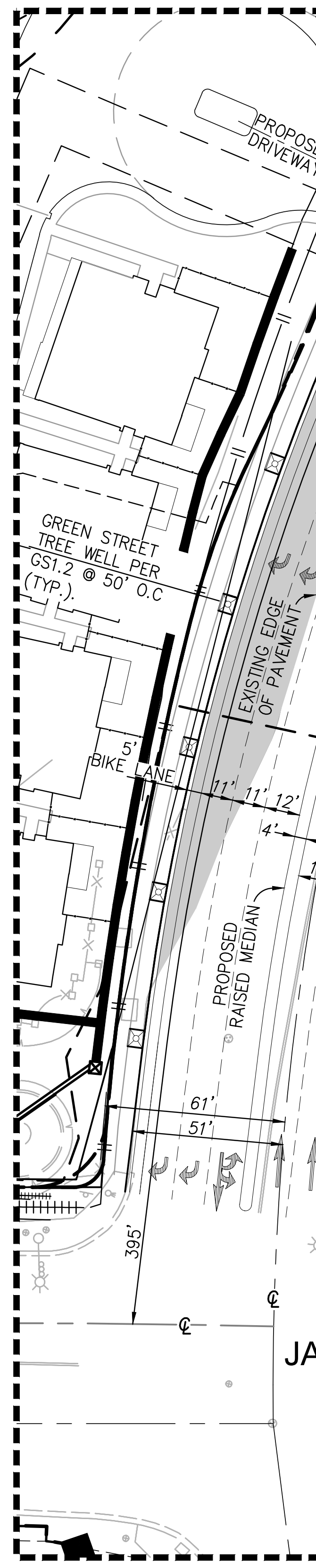


SECTION 'A-A'



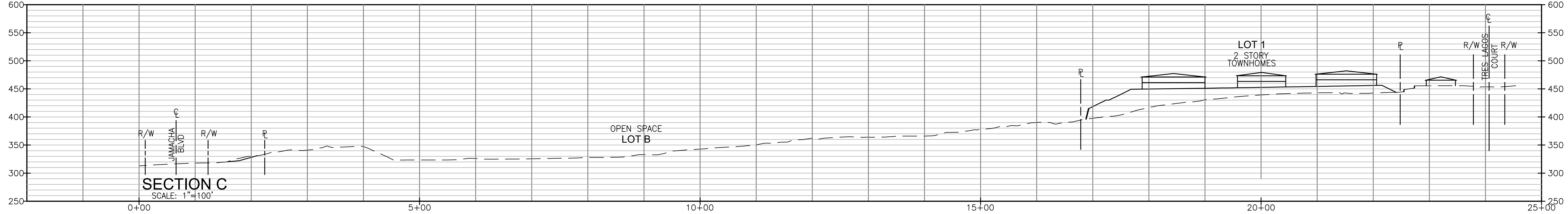
TYPICAL BUILDABLE ENVELOPE
MULTI-FAMILY LOT

NO SCALE



LOT 3 ACCESS DETAIL

SCALE: 1"=40'



SECTION C

SCALE: 1"=100'

SHEET 4 OF 4

NO.	DATE	REVISION

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ROBERT A. CHASE RCE 41903 DATE

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ATTACHMENT 6

Copy of Project's Drainage Report

This is the cover sheet for Attachment 6.

If hardcopy or CD is not attached, the following information should be provided:

Title:
Prepared By:
Date:

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DRAINAGE REPORT

Sweetwater Vistas
Spring Valley, CA
October 2016

Prepared For: Sweetwater Vistas, LLC

Prepared By: Fuscoe Engineering, Inc.

Job Number: 02780.002.01

FUSCOE
ENGINEERING
full circle thinking

HYDROLOGY and HYDRAULICS STUDY

Sweetwater Vistas

Record ID: PDS2015-GPA-15-006, PDS2015-SPA-15-002,
PDS2015-REZ-15-008, PDS2015-TM-5608, PDS2015-MUP-89-015W4, PDS2015-STP-15-016
PROJECT ADDRESS: Sweetwater Springs and Jamacha Blvd
APN: 505-672-03, 07, 09, 10, 11, 23 & 37
TRUST ACCOUNT NO.: 2030222-D-02695

COUNTY OF SAN DIEGO, CA

Prepared By:

Robert A. Chase, PE RCE 41903 EXP: 03-31-18
Fuscoe Engineering, Inc.
6390 Greenwich Dr., Ste 170
San Diego, CA 92122

For

Sweetwater Vistas, LLC
1620 Fifth Avenue, Suite 400
San Diego, CA 92101
619-906-4353

October 2016

TABLE OF CONTENTS

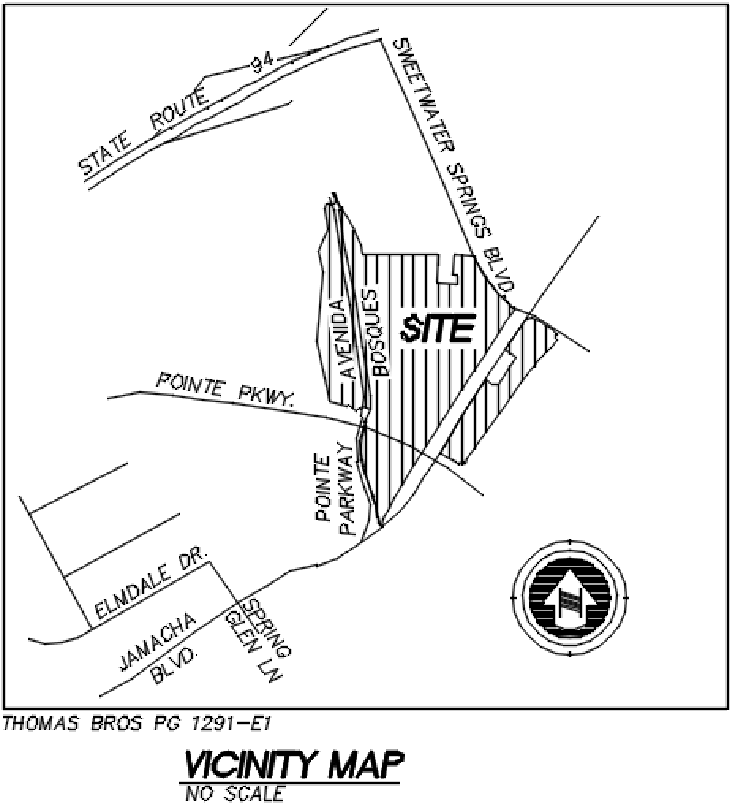


Figure 1 Vicinity Map

1.0 PROJECT DESCRIPTION

The Sweetwater Vistas project consists of approximately 52.0 acres and is located in the unincorporated area of Spring Valley. Approximately 43.5 acres of the project are located at the northwest corner of Jamacha Boulevard and Sweetwater Springs Boulevard (the "Western Parcel"). Approximately 8.5 acres of the project are located at the southeast corner of Jamacha Boulevard and Sweetwater Springs Boulevard, directly west of the Otay Water District offices (the "Eastern Parcel"). These sites are bisected by Jamacha Boulevard. The project proposes the development of a new master planned community consisting of 218 multi-family residential units on three pads and the extension of Avenida Bosques, all in the Western Parcel. Approximately 25.9 acres of the total project will be proposed for reservation as biological open space.

2.0 SITE INFORMATION

The following sections summarize the site conditions which relate to drainage and hydromodification, including the geotechnical conditions, drainage basins, and the low flow threshold determination.

2.1 GEOTECHNICAL CONDITIONS

The Hydrologic Soils Group for the project was determined from the SANGIS Hydromod BMP Website. The site for this project is a mix of Hydrologic Soil Group C and Group D.

Please refer to Appendix 2 for the custom soils map.

2.2 BASIN DESCIPTION

The existing site consists of one main basin, which is divided into two sub-basins. Runoff from the first sub-basin (A1) drains into a large existing detention basin located north of the intersection of Jamacha Blvd. and Pointe Parkway. Multiple residences adjacent to the project site, discharges their runoff onto the property which conveys into a natural flow path where it is picked up by an existing 84" RCP storm drain that extends below Jamacha Blvd.

To account for both existing and proposed runoff, the following design is prepared:

- An existing 30" Storm Drain located on California Waters Drive is now to be connected with the existing 36" Storm Drain located on the Avenida Bosques at station 23+70.

- The existing 36" storm drain will continue south along the proposed road (Avenida Bosques) instead of discharging onto the project site, which is the existing design condition.

- Additional runoff is collected from Foothill Court and Fabled Waters Court, which outlets through an existing 18" storm drain. This runoff crosses over natural terrain and is picked up by a brow ditch and discharged into the same 36" storm drain as mentioned above. The runoff within the 36" storm drain is clean and outlets into the natural area located at station 11+50.

- Roadway runoff from the proposed road (Avenida Boques) is picked up by four sets of inlets located at 7+10, 13+20, 15+40, and 19+50. This runoff discharges into a 36" storm drain that runs along Avenida Bosques. The runoff outlets at station 7+10 where it is treated by a water quality basin. It then confluences with the runoff from Lot 2, which is also treated by a water quality basin. This treated and clean water from the proposed road and lot 2 conveys into a natural flow path into the existing detention basin.

- Lots 1 and 3 are also treated by water quality basins and convey into a natural flow path. All natural flow paths lead into the large existing detention basin, where it is then discharged through the existing 84" storm drain system that extends below Jamacha Blvd.

The second sub-basin (A2) collects runoff from Sweetwater Springs Blvd, Jamacha Blvd. and Pointe Parkway which confluences at the intersection of Jamacha Blvd. and Pointe Parkway (existing node number 36 and proposed node number 28), where the runoff discharges into the same existing storm drain system along Jamacha Blvd.

Please refer to Appendices 6 and 7 for a graphical depiction of these drainage patterns.
Please refer to Appendix 8 for the As-built drawings that illustrate the locations of the existing utilities.

3.0 METHODOLOGY

3.1 RATIONAL METHOD

The design criteria, as found in the County of San Diego Department of Public Works Flood Control Division Hydrology Manual, specifies the design runoff conditions within the San Diego County Flood Control District will be based on the 100-year storm frequency, as follows:

1.) Design for areas over 1 square mile will be based on the 100-year frequency storm.
2.) For areas under 1 square mile –
    a. The storm drain system shall be designed so that the combination of storm drain system capacity and overflow both inside and outside the right of way will be able to carry the 100 year frequency storm without damaging adjacent existing buildings or potential building sites.
    b. The storm drain system shall be designed so that the combination of storm drain system capacity and allowable street overflow will be able to carry the 50 year frequency storm without damaging adjacent property.
    c. Where a storm drain is required under headings 1 or 2 above, then as a minimum, the drain shall be designed to carry the 10-year frequency storm.
3.) Sump areas are to be designed for a sump capacity or outfall of a 100-year frequency storm.

Runoff produced on the project site will be calculated for the 100-year storm event using the methodology outlined in the 2003 San Diego County Hydrology Manual. Runoff will be calculated using the Rational Method, which is given by the following equation:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Soil Type – Hydrologic soil groups C and D are the prevalent soil groups on the project site as can be seen in the Soil Hydrologic Groups map provided in appendix 2. Group C soils have slow infiltration rates when thoroughly wetted. This consists of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. Group D soils have a very slow infiltration rate when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials. Both type C & D soils have a very slow rate of water transmission.

Runoff Coefficient – In accordance with the County of San Diego standards, the appropriate runoff coefficients were determined based on table 3-1 from the 2003 San Diego County Hydrology Manual. Pervious areas were assigned a runoff coefficient of C= 0.30 for type C soil and C= 0.35 for type D soil. Sub-basins that consists of a mixture of pervious and impervious surfaces were assigned a runoff coefficient of C= 0.69 for type C soil and C= 0.71 for type D soil, which was based on a density of 24.0 DU/A or less. The proposed roads through the site were given a C factor of 0.81 or 0.82 based on the road section being 85% impervious, which is in accordance to table 3-1. When both soil types C and D are present, a weighted average is utilized to determine the proper runoff coefficient for each basin.

	Soil Type C	Soil Type D
Pervious	0.30	0.35
Impervious	0.69	0.71
Proposed Roads	0.81	0.82

3.2 Cistern Detention Analysis

The cisterns on the project have dual purposes. The first purpose is to provide the storage necessary to satisfy the project's hydromodification requirements (0.1 Q2 - Q10). The second purpose is to provide storage for larger events (Q10-Q100) so that the outgoing flows will remain at or below the existing levels.

Per the hydromodification report, each cistern was sized with a small orifice at the bottom. The maximum ponding depth for the 10 year storm was determined and then a larger orifice was added at that elevation. During storm events where hydromodifcation is required, only the single small orifice at the bottom will be utilized. Once a storm becomes large enough where hydromodification is no longer required, the upper orifice will be utilized as well.

	Cistern Dimensions			Orifice Sizing				Ponding Depth		Post Detention Results
				Lower		Upper				
DMA	Cistern Area (sf)	Bottom Elev	Top Elev	size (in)	elev (ft)	size (in)	elev (ft)	Q10 W.S (ft)	Q100 W.S. (ft)	Q100 out (cfs)
1.1, 1.2	3,645	440	446	0.7	440	12	445	445	445.6	1.3
1.3	2,700	447	452	0.8	447	12	450.6	450.6	451.3	1.7
2	4,420	399	404	1	399	12	402.6	402.6	403.4	2.1
3	6,000	418	424.5	0.9	418	6	422.3	422.3	423.8	0.9
4	4,175	365	372.5	0.9	365	6	369.7	369.5	371.5	1.0

The calculations summarized in the table above can be found in Appendix 5.

Once a post-detention Q100 was obtained at the outlet of each detention area, the resulting Q was input into AES at the appropriate node number. The resulting downstream post detention Q's are reported in Section 4.0 below.

4.0 CALCULATIONS/RESULTS

The results of the hydrology analysis are presented below:

Basin A1

	A (Acre)	Tc (Min.)	Q (CFS)
Existing	47.0	17.4	576
Proposed (Post Detention)	49.6	17.4	576
Change	+2.6	0	0

See appendix 3 & 4 for AES Analysis, Appendix 5 for Cistern Detention

Basin A2

	A (Acre)	Tc (Min.)	Q (CFS)
Existing	11.2	11.1	31
Proposed	8.8	11.5	31
Change	-2.4	+0.4	0

See appendix 5 & 6 for AES Analysis

5.0 INUNDATION LINE

In order to determine an inundation line for the 100 year storm, flows at the bottom of the canyon were analyzed using HEC-RAS 4.1 software developed by the Army Corps of Engineers. The input data for this software was developed from cross sections of the canyon. A mannings factor of 0.1 was used to model the flow path in a "heavily vegetated" condition. Output from the software is attached in Appendix 9 and includes a summary of 100 year storm water surface elevations. An inundation line was plotted based on the water surface elevations and can be found on the HEC-RAS Analysis exhibit.

6.0 SUMMARY AND CONCLUSIONS

The storm drain system for Sweetwater Vistas has been designed for the 100 year storm event. The overall area increases by 0.2 AC, which is reflective of excluding the Avenida Bosques cul-de-sac in the existing AES calculation. However, with the proposed extension of Avenida Bosques, the cul-de-sac area must be accounted for when calculating the proposed drainage rates.

Tables from Section 4.0 Calculations/Results summarize both existing and proposed conditions of this project. Through the use of underground cisterns, the project will not see an increase in 100 Year storm event flows leaving the site. Thus, the proposed hydrology design yields no impact to either the present adjacent residents or the future residents upon completion of the project. AES calculations support that the proposed road was adequately designed and will not flood during a 100 year storm event.

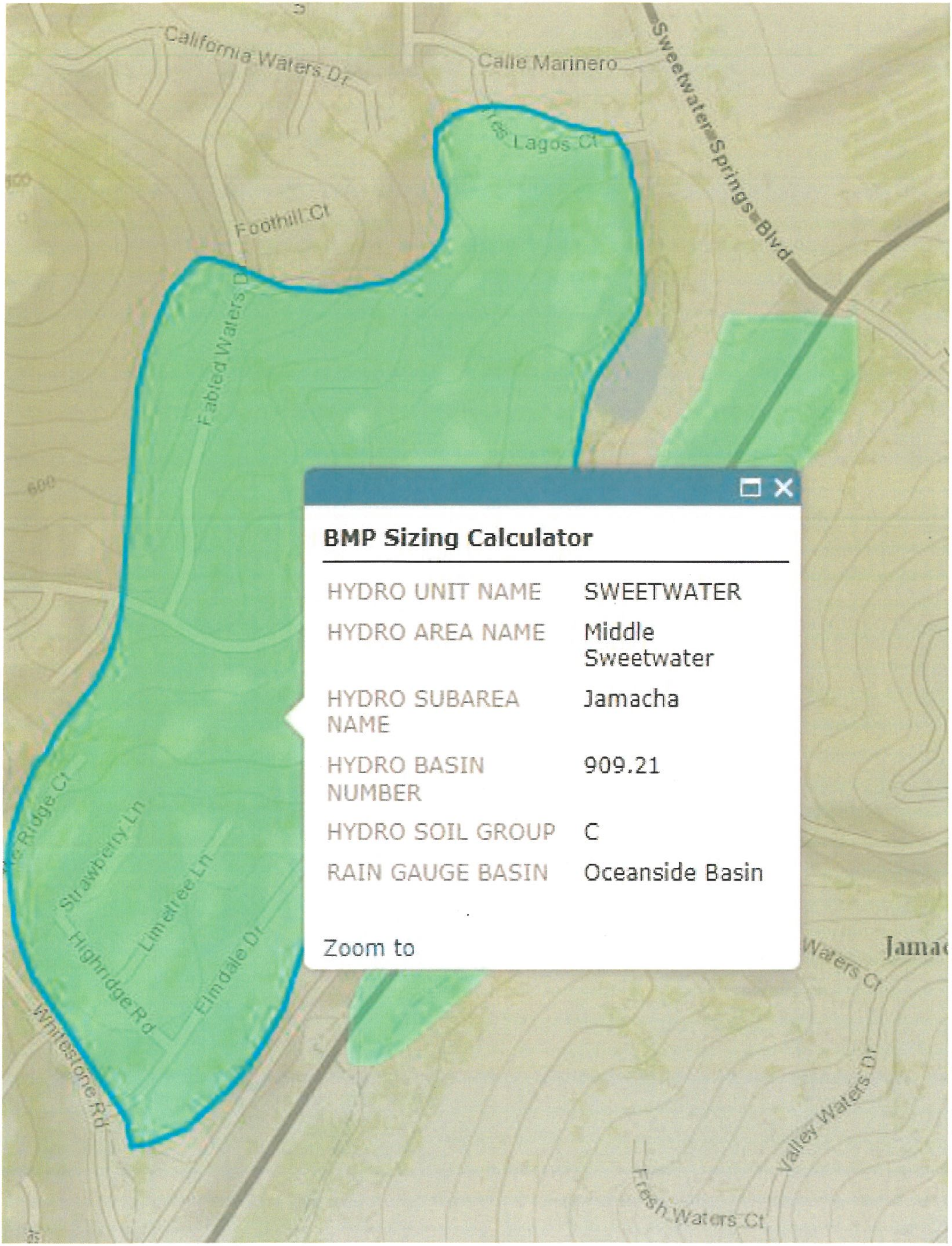
For reservoir and storage calculations please see the Hydromodification Management Plan prepared for this submittal as well as Appendix 5 of this report.

Flows during the 100 year storm will remain well below the level of any proposed storm drain outlets or grading. Detailed results from the HEC-RAS study can be found in Appedix 9 and a 100 year inundation line has been plotted on the HEC-RAS Analysis Exhibit.

7.0 APPENDICES

Appendix 1: Hydrology Manual Excerpts
Appendix 2: Soils Map
Appendix 3: AES Existing Hydrology Analysis
Appendix 4: AES Proposed Hydrology Analysis
Appendix 5: Cistern Detention Analysis
Appendix 6: Existing Drainage Map
Appendix 7: Proposed Drainage Map
Appendix 8: As-Built Drawings – Existing Utilities
Appendix 9: HEC-RAS Study

APPENDIX 1: HYDROLOGY MANUAL EXCERPTS



BMP Sizing Calculator

HYDRO UNIT NAME	SWEETWATER
HYDRO AREA NAME	Middle Sweetwater
HYDRO SUBAREA NAME	Jamacha
HYDRO BASIN NUMBER	909.21
HYDRO SOIL GROUP	C
RAIN GAUGE BASIN	Oceanside Basin

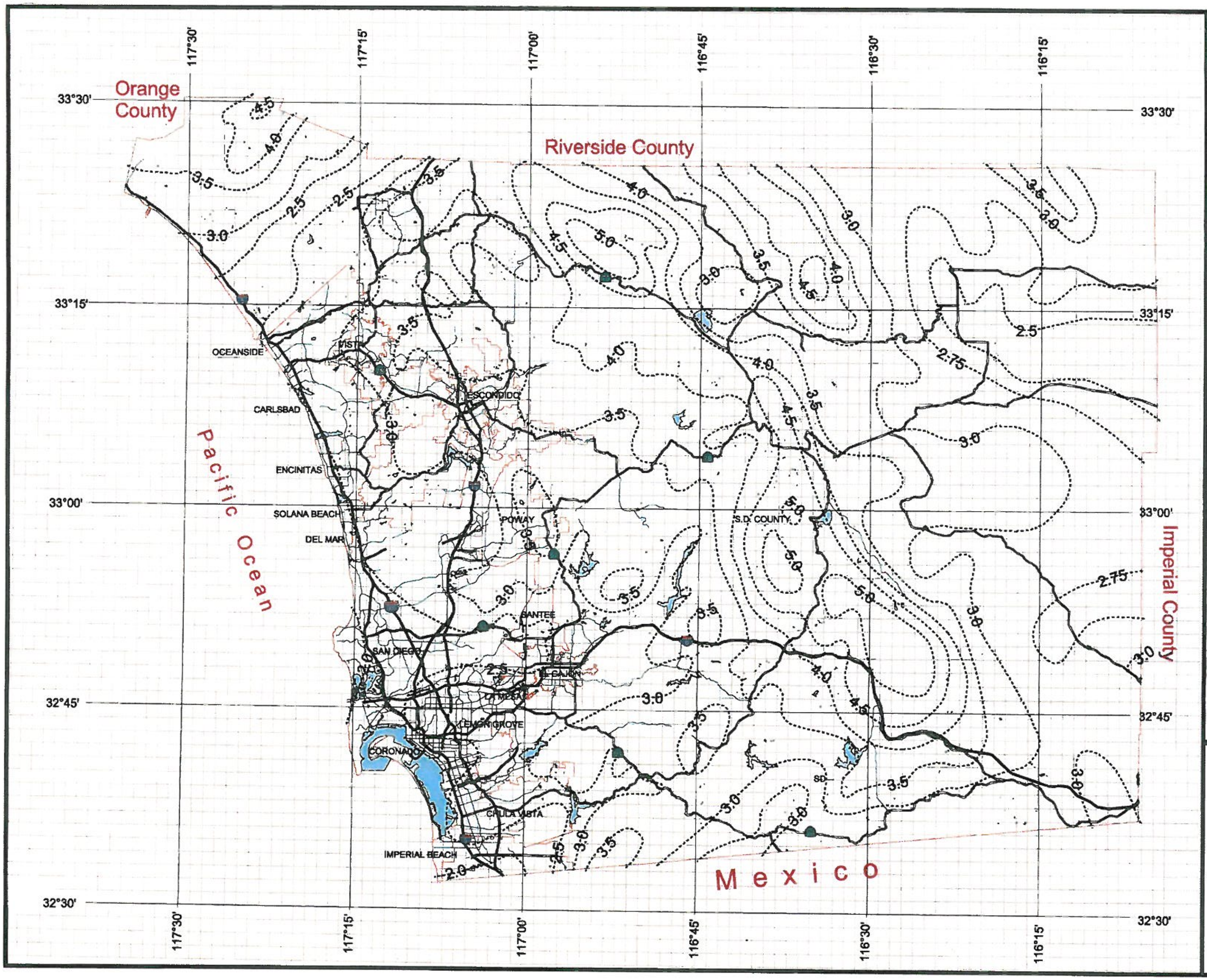
Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

------- Isopluvial (inches)

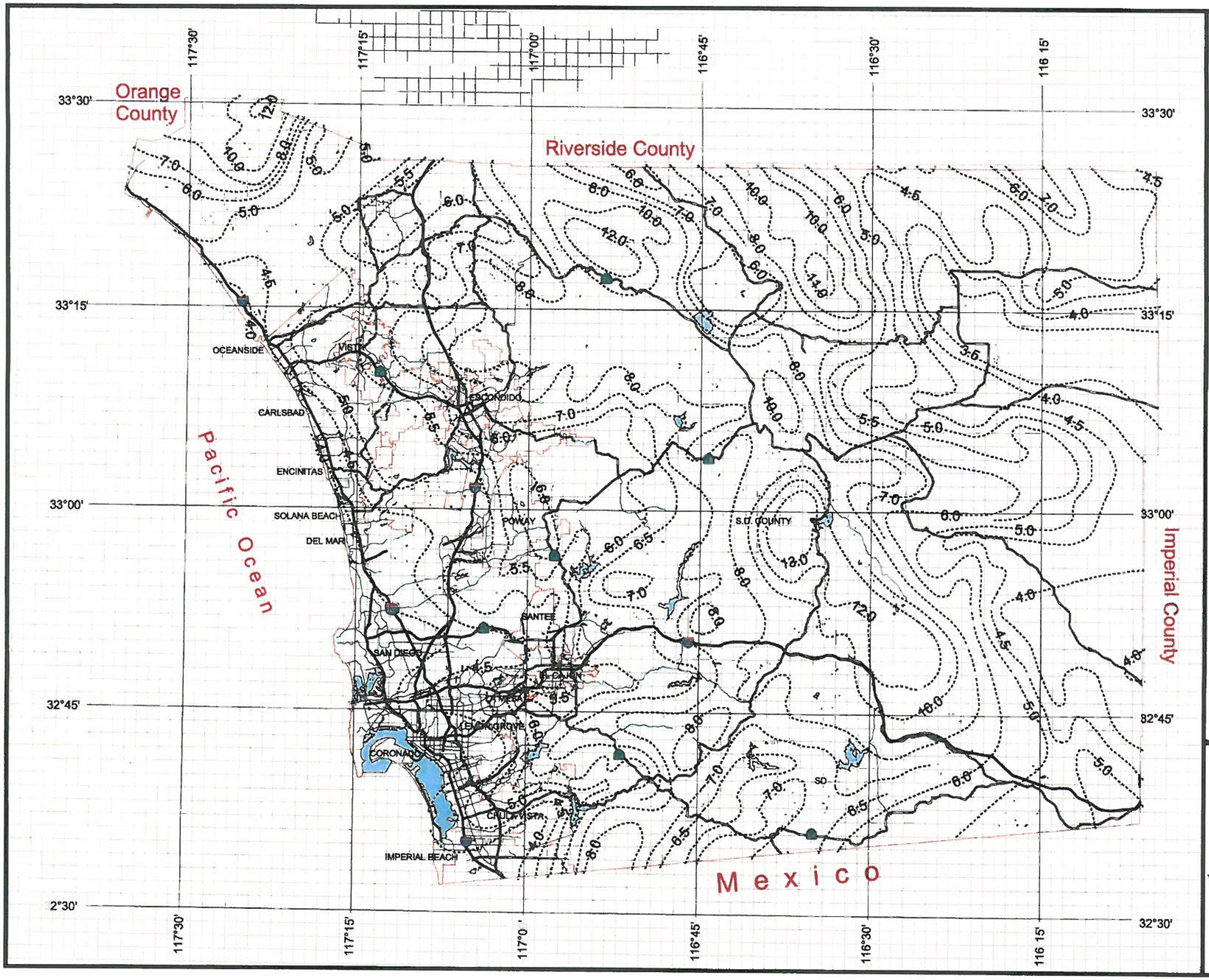
$P_6 = 3,0$

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

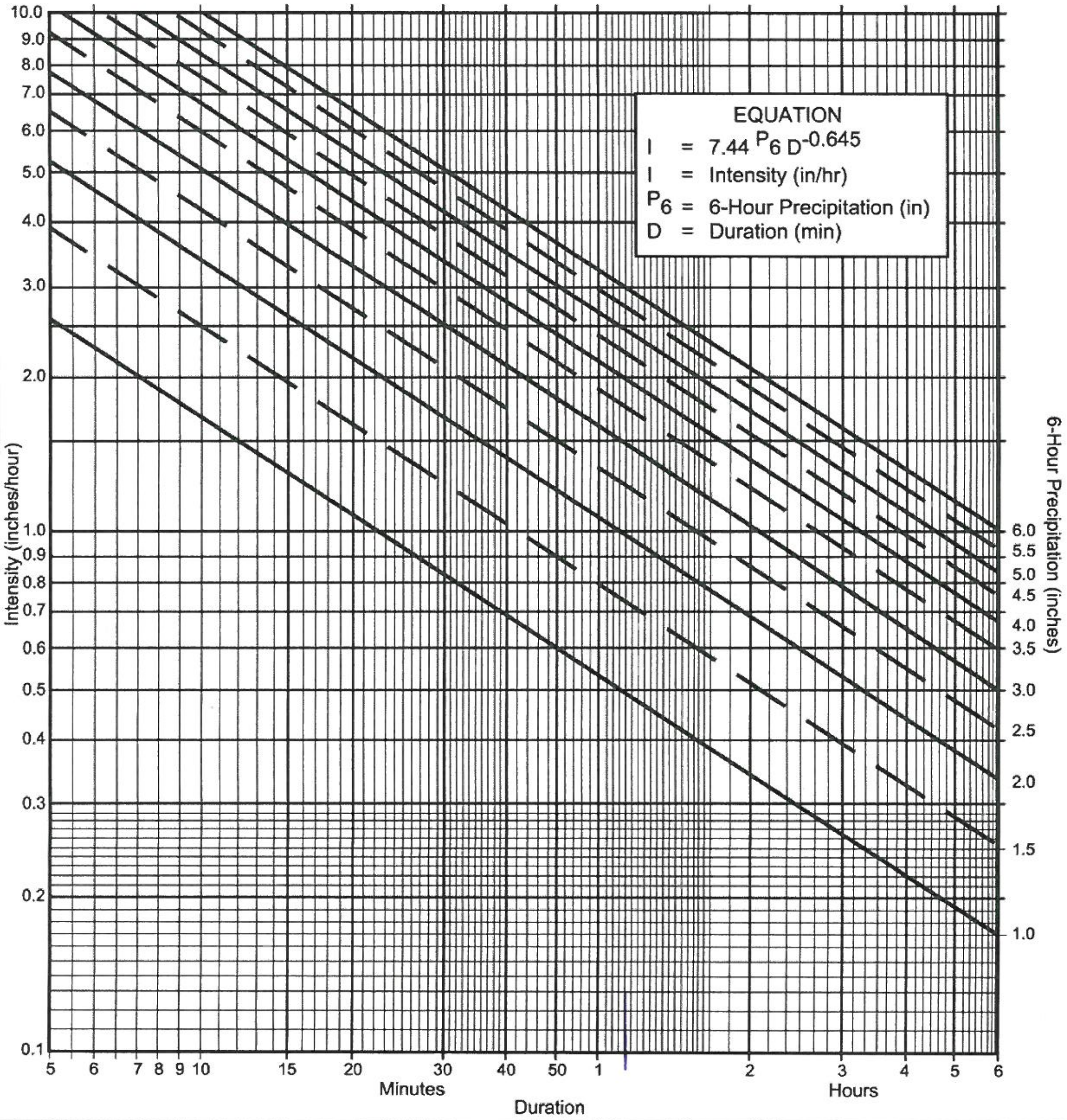
100 Year Rainfall Event - 24 Hours

┄┄┄ Isopluvial (inches)

$P_{24} = 6.0$

N
W E
S

3 0 3 Miles



EQUATION

$I = 7.44\,P_6\,D^{-0.645}$

I = Intensity (in/hr)

P_6 = 6-Hour Precipitation (in)

D = Duration (min)

Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.0 in., P_{24} = 6.0, $\frac{P_6}{P_{24}}$ = 50 %$^{(2)}$

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

(d) t_x = ______ min.

(e) I = ______ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE

3-1

APPENDIX 2: SOILS MAP

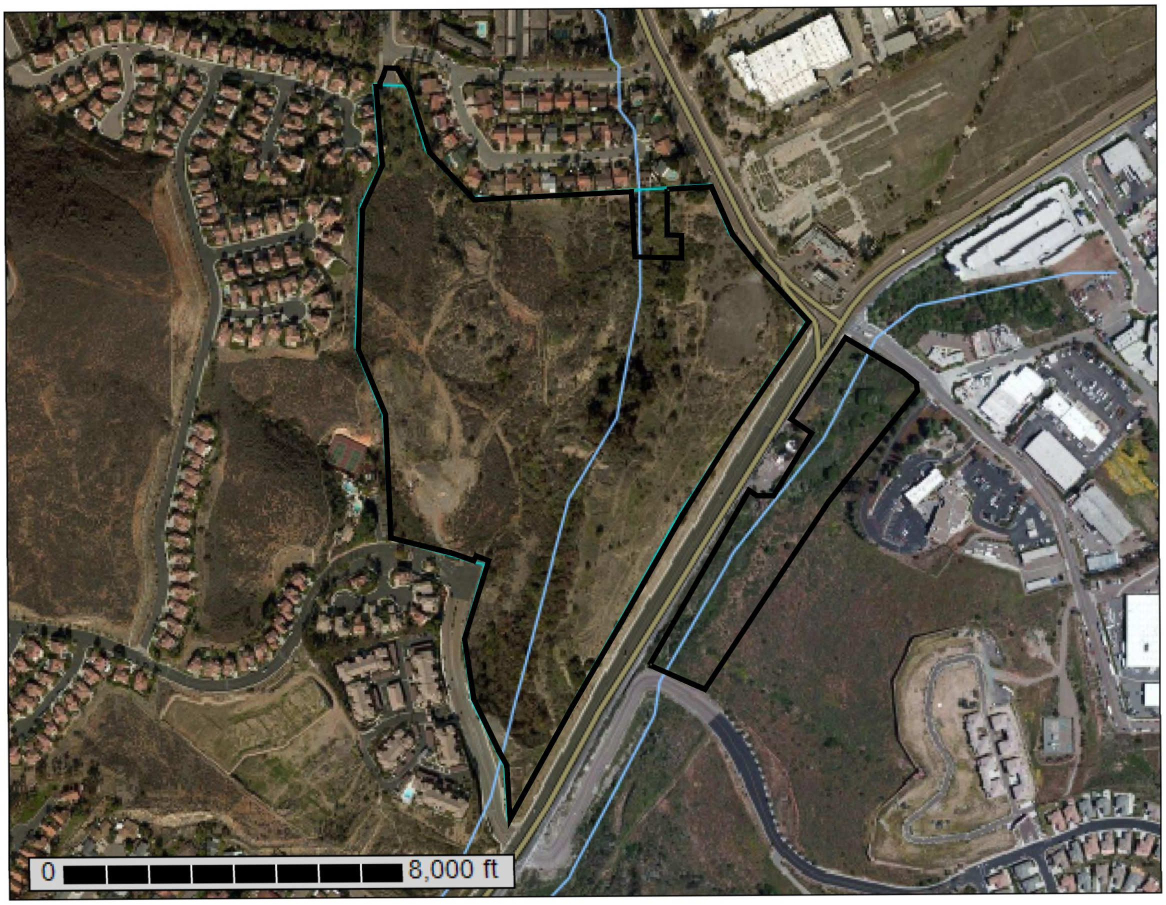
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

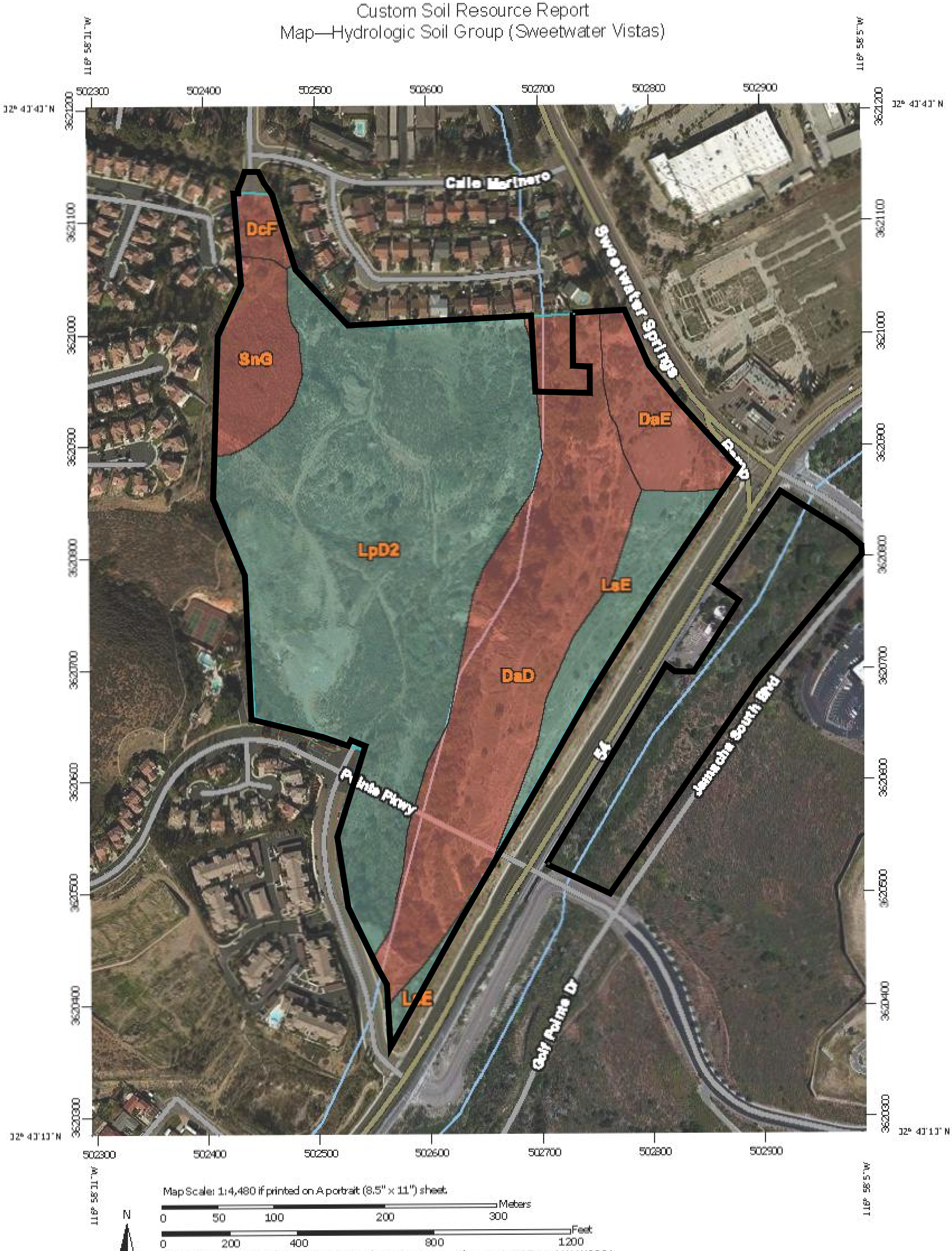
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
San Diego County Area, California



July 6, 2015

Map—Hydrologic Soil Group (Sweetwater Vistas)



Map Scale: 1:4,480 if printed on A portrait (8.5" × 11") sheet.

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

MAP LEGEND

Area of Interest (AOI)

- ▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- 〰 Streams and Canals

Transportation

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

Background

- ▨ Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 8, Sep 17, 2014

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

Date(s) aerial images were photographed: May 3, 2010—Jan 4, 2015

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

Table—Hydrologic Soil Group (Sweetwater Vistas)

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
DaD	Diablo clay, 9 to 15 percent slopes	D	12.2	27.7%
DaE	Diablo clay, 15 to 30 percent slopes	D	2.4	5.5%
DcF	Diablo-Urban land complex, 15 to 50 percent slopes	D	0.6	1.4%
LpD2	Las Posas fine sandy loam, 9 to 15 percent slopes, erod ed	C	23.2	52.5%
LsE	Linne clay loam, 9 to 30 percent slopes	C	3.2	7.3%
SnG	San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes	D	2.5	5.6%
Totals for Area of Interest			**44.1**	**100.0%**

Rating Options—Hydrologic Soil Group (Sweetwater Vistas)

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

APPENDIX 3: AES EXISTING HYDROLOGY ANALYSIS
(SEE APPENDIX 6-EXISTING DRAINAGE MAP)

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

Job Name: Sweetwater Vistas

Date: 7/10/15

Job #: 2780-002

Run Name:
E1.DAT

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
96	94	2	488	483	70	0.35	0.16				
94	94	1						1 of 2			
98	98	7	Q=49.1 Tc=10min A=0								
98	94	5	491	483	90	0.35					
94	94	1						2 of 2			
94	92	5	483	460	360	0.34	2.18				
92	90	5	460	457	165	0.34	2.33				
90	88	5	457	418	580	0.3	3.89				
88	82	5	418	352	480	0.3	1.49				
82	82	1						1 of 2			
91	89	2	606.4	604.5	40	0.9	0.08				
89	87	6	604.5	558.1	350	0.54	2.45	2 SIDES OF STREET			
87	86	3	554.1	552.2	190						
86	84	5	552.2	386	830	0.32	4.28				
84	82	5	386	352	275	0.3	0.59				
82	82	1						2 of 2			
82	74	5	352	337	165	0.3	1.06				
74	74	10						save to bank 1	▨		
									▨		
81	79	2	443.8	443.2	53	0.9	0.12		▨		
79	78	6	443.2	440	440	0.9	0.63	ONE SIDE OF STREET	▨		
78	76	5	440	391	325	0.35	1.09		▨		
76	76	1						1 of 2	▨		
77	77	7	Q=500 Tc=15 min A=0						▨		
77	76	5	415	391	130				▨		
76	76	1						2 of 2	▨		
76	74	5	391	337	1,050	0.34	10.28		▨		
74	74	11						add bank 1	▨		
74	70	5	337	335	75	0.35	0.58				
70	70	1						1 of 2			
75	74	2	606.4	603.5	93.5	0.9	0.16				
74	73	6	603.5	570.6	310	0.54	2.02	2 SIDES OF STREET			
73	72	3	564.6	559	95						
72	70	5	555	335	1,385	0.3	6.44				
70	70	1						2 of 2			
70	68	5	335	323	750	0.33	7.12				
							46.95				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                            6390 Greenwich Drive
                                 Suite 200
                            San Diego, CA 92122

 ************************** DESCRIPTION OF STUDY ***************************
* SWEETWATER VISTAS                                                         *
* EXISTING HYDROLOGY                                                        *
* RUN 1                                                                     *
 ***************************************************************************

  FILE NAME: E1.DAT
  TIME/DATE OF STUDY: 15:26 02/17/2016
-----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*****************************************************************************
  FLOW PROCESS FROM NODE     96.00 TO NODE     94.00 IS CODE =  21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    488.00
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.865
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.131
```

```
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.87
  RAINFALL INTENSITY(INCH/HR) =   7.13
  TOTAL STREAM AREA(ACRES) =     0.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE     98.00 TO NODE     98.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  10.00   RAIN INTENSITY(INCH/HOUR) =  5.05
  TOTAL AREA(ACRES) =     0.01   TOTAL RUNOFF(CFS) =     49.10

****************************************************************************
  FLOW PROCESS FROM NODE     98.00 TO NODE     94.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    491.00  DOWNSTREAM(FEET) =    483.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    90.00   CHANNEL SLOPE =  0.0889
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0889 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      49.10
  FLOW VELOCITY(FEET/SEC) =   6.11 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.25   Tc(MIN.) =   10.25
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     94.00 =      90.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 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.) =   10.25
  RAINFALL INTENSITY(INCH/HR) =   4.98
  TOTAL STREAM AREA(ACRES) =     0.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     49.10

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.40     5.87        7.131          0.16
      2       49.10    10.25        4.976          0.01

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       28.51     5.87       7.131
      2       49.38    10.25       4.976

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      49.38   Tc(MIN.) =   10.25
  TOTAL AREA(ACRES) =        0.2
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     94.00 =      90.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     92.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    460.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   360.00   CHANNEL SLOPE =  0.0639
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.793
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      51.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   9.76
  AVERAGE FLOW DEPTH(FEET) =   1.03   TRAVEL TIME(MIN.) =   0.61
  Tc(MIN.) =   10.86
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    3.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  4.473
  TOTAL AREA(ACRES) =        2.4         PEAK FLOW RATE(CFS) =      50.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.03   FLOW VELOCITY(FEET/SEC.) =   9.70
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     92.00 =     450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     92.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    457.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   165.00   CHANNEL SLOPE =  0.0182
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.670
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      52.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.19
  AVERAGE FLOW DEPTH(FEET) =   1.44   TRAVEL TIME(MIN.) =   0.44
  Tc(MIN.) =   11.31
  SUBAREA AREA(ACRES) =     2.33       SUBAREA RUNOFF(CFS) =    3.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  2.415
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =      52.79

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.44   FLOW VELOCITY(FEET/SEC.) =   6.20
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     90.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     88.00 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    457.00  DOWNSTREAM(FEET) =    418.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   580.00   CHANNEL SLOPE =  0.0672
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.433
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      55.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.16
  AVERAGE FLOW DEPTH(FEET) =   1.06   TRAVEL TIME(MIN.) =   0.95
  Tc(MIN.) =   12.26
  SUBAREA AREA(ACRES) =     3.89       SUBAREA RUNOFF(CFS) =    5.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  1.455
  TOTAL AREA(ACRES) =        8.6         PEAK FLOW RATE(CFS) =      55.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.06   FLOW VELOCITY(FEET/SEC.) =  10.14
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     88.00 =    1195.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     88.00 TO NODE     82.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    418.00  DOWNSTREAM(FEET) =    352.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   480.00   CHANNEL SLOPE =  0.1375
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.297
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      56.24
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.22
  AVERAGE FLOW DEPTH(FEET) =   0.89   TRAVEL TIME(MIN.) =   0.60
  Tc(MIN.) =   12.86
  SUBAREA AREA(ACRES) =     1.49       SUBAREA RUNOFF(CFS) =    1.92
  AREA-AVERAGE RUNOFF COEFFICIENT =  1.284
  TOTAL AREA(ACRES) =       10.1         PEAK FLOW RATE(CFS) =      55.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.88   FLOW VELOCITY(FEET/SEC.) =  13.21
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE     82.00 =    1675.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     82.00 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.) =   12.86
  RAINFALL INTENSITY(INCH/HR) =   4.30
  TOTAL STREAM AREA(ACRES) =    10.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     55.51

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

```
  FLOW PROCESS FROM NODE     91.00 TO NODE     89.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    606.40
  DOWNSTREAM ELEVATION(FEET) =    604.50
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.355
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     87.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  604.50  DOWNSTREAM ELEVATION(FEET) =  558.10
  STREET LENGTH(FEET) =   350.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.80
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.41
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.55
  STREET FLOW TRAVEL TIME(MIN.) =   0.91   Tc(MIN.) =    2.27
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.551
  SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =   10.46
  TOTAL AREA(ACRES) =        2.5        PEAK FLOW RATE(CFS) =      11.03

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.97
  FLOW VELOCITY(FEET/SEC.) =  7.31   DEPTH*VELOCITY(FT*FT/SEC.) =   2.09
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     87.00 =     390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     87.00 TO NODE     86.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   554.10  DOWNSTREAM(FEET) =   552.20
  FLOW LENGTH(FEET) =   190.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.83
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.03
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    2.73
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     86.00 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     86.00 TO NODE     84.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    552.20  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   830.00   CHANNEL SLOPE =  0.2002
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.52
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   1.31
  Tc(MIN.) =    4.04
  SUBAREA AREA(ACRES) =     4.28       SUBAREA RUNOFF(CFS) =   10.83
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.406
  TOTAL AREA(ACRES) =        6.8        PEAK FLOW RATE(CFS) =      21.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =  11.39
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     84.00 =    1410.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     82.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    386.00  DOWNSTREAM(FEET) =    352.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.1236
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   9.78
  AVERAGE FLOW DEPTH(FEET) =   0.56   TRAVEL TIME(MIN.) =   0.47
  Tc(MIN.) =    4.51
  SUBAREA AREA(ACRES) =     0.59       SUBAREA RUNOFF(CFS) =    1.40
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.398
  TOTAL AREA(ACRES) =        7.4        PEAK FLOW RATE(CFS) =      23.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.57   FLOW VELOCITY(FEET/SEC.) =   9.87
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     82.00 =    1685.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     82.00 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.) =    4.51
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =    7.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     23.25

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        55.51    12.86        4.297        10.06
     2        23.25     4.51        7.904         7.40

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
     1        53.43     4.51       7.904
     2        68.15    12.86       4.297

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      68.15   Tc(MIN.) =   12.86
  TOTAL AREA(ACRES) =       17.5
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     82.00 =    1685.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     74.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    352.00  DOWNSTREAM(FEET) =    337.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   165.00   CHANNEL SLOPE =  0.0909
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.249
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      68.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.01
  AVERAGE FLOW DEPTH(FEET) =   1.10   TRAVEL TIME(MIN.) =   0.23
  Tc(MIN.) =   13.09
  SUBAREA AREA(ACRES) =     1.06       SUBAREA RUNOFF(CFS) =    1.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.873
  TOTAL AREA(ACRES) =       18.5         PEAK FLOW RATE(CFS) =      68.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.10   FLOW VELOCITY(FEET/SEC.) =  11.99
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     74.00 =    1850.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     74.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE     79.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    53.00
  UPSTREAM ELEVATION(FEET) =    443.80
  DOWNSTREAM ELEVATION(FEET) =    443.20
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.515
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE     79.00 TO NODE     78.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  443.20  DOWNSTREAM ELEVATION(FEET) =  440.00
  STREET LENGTH(FEET) =   440.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.72
  STREET FLOW TRAVEL TIME(MIN.) =   3.60   Tc(MIN.) =    6.11
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.945
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    0.63      SUBAREA RUNOFF(CFS) =    3.94
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.69

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.87
  FLOW VELOCITY(FEET/SEC.) =  2.30   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE     81.00 TO NODE     78.00 =     493.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     78.00 TO NODE     76.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    440.00  DOWNSTREAM(FEET) =    391.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.1508
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.417
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.80
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   0.80
  Tc(MIN.) =    6.91
  SUBAREA AREA(ACRES) =     1.09       SUBAREA RUNOFF(CFS) =    2.45
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.574
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       6.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   7.10
  LONGEST FLOWPATH FROM NODE     81.00 TO NODE     76.00 =     818.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     76.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.91
  RAINFALL INTENSITY(INCH/HR) =   6.42
  TOTAL STREAM AREA(ACRES) =     1.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.78

****************************************************************************
  FLOW PROCESS FROM NODE     77.00 TO NODE     77.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  15.00   RAIN INTENSITY(INCH/HOUR) =  3.89
  TOTAL AREA(ACRES) =     0.00   TOTAL RUNOFF(CFS) =    500.00

****************************************************************************
  FLOW PROCESS FROM NODE     77.00 TO NODE     76.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    415.00  DOWNSTREAM(FEET) =    391.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.1846
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1523 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =     500.00
  FLOW VELOCITY(FEET/SEC) =  17.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.13   Tc(MIN.) =   15.13
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     76.00 =    1815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     76.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.13
  RAINFALL INTENSITY(INCH/HR) =   3.87
  TOTAL STREAM AREA(ACRES) =     0.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    500.00

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.78     6.91        6.417          1.84
      2      500.00    15.13        3.871          0.00

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      235.10     6.91       6.417
      2      504.09    15.13       3.871

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     504.09   Tc(MIN.) =   15.13
  TOTAL AREA(ACRES) =       1.8
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     76.00 =    1815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     74.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    391.00  DOWNSTREAM(FEET) =    337.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1050.00   CHANNEL SLOPE =  0.0514
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.704
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     510.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  16.43
  AVERAGE FLOW DEPTH(FEET) =   3.26   TRAVEL TIME(MIN.) =   1.06
  Tc(MIN.) =   16.19
  SUBAREA AREA(ACRES) =    10.28       SUBAREA RUNOFF(CFS) =   12.95
  AREA-AVERAGE RUNOFF COEFFICIENT = 10.977
  TOTAL AREA(ACRES) =       12.1         PEAK FLOW RATE(CFS) =     504.09

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.25   FLOW VELOCITY(FEET/SEC.) =  16.37
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     74.00 =    2865.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     74.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
```

```
    1      504.09    16.19       3.704       12.12
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     74.00 =    2865.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1        68.73    13.09       4.249       18.52
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     74.00 =    1850.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1     476.31      13.09         4.249
    2     564.02      16.19         3.704

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     564.02   Tc(MIN.) =   16.19
  TOTAL AREA(ACRES) =       30.6

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     70.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    337.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.0267
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.691
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     564.39
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.17
  AVERAGE FLOW DEPTH(FEET) =   3.94   TRAVEL TIME(MIN.) =   0.09
  Tc(MIN.) =   16.29
  SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    0.75
  AREA-AVERAGE RUNOFF COEFFICIENT =  4.786
  TOTAL AREA(ACRES) =       31.2         PEAK FLOW RATE(CFS) =     564.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.94   FLOW VELOCITY(FEET/SEC.) =  13.16
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     70.00 =    2940.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 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.) =   16.29
  RAINFALL INTENSITY(INCH/HR) =   3.69
  TOTAL STREAM AREA(ACRES) =    31.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    564.02

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     74.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.50
  UPSTREAM ELEVATION(FEET) =    606.40
  DOWNSTREAM ELEVATION(FEET) =    603.50
  ELEVATION DIFFERENCE(FEET) =      2.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.387
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.14
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      1.14

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     73.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  603.50  DOWNSTREAM ELEVATION(FEET) =  570.60
  STREET LENGTH(FEET) =   310.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.45
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.92
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.42
  STREET FLOW TRAVEL TIME(MIN.) =   0.89   Tc(MIN.) =    3.27
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.566
  SUBAREA AREA(ACRES) =    2.02      SUBAREA RUNOFF(CFS) =    8.62
  TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =       9.76

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.97
  FLOW VELOCITY(FEET/SEC.) =  6.47   DEPTH*VELOCITY(FT*FT/SEC.) =   1.85
  LONGEST FLOWPATH FROM NODE     75.00 TO NODE     73.00 =     403.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     73.00 TO NODE     72.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   564.60  DOWNSTREAM(FEET) =   559.00
  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   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.96
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.76
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    3.40
  LONGEST FLOWPATH FROM NODE     75.00 TO NODE     72.00 =     498.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     70.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    555.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1385.00   CHANNEL SLOPE =  0.1588
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.214
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   9.77
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   2.36
  Tc(MIN.) =    5.76
  SUBAREA AREA(ACRES) =     6.44       SUBAREA RUNOFF(CFS) =   13.94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.367
  TOTAL AREA(ACRES) =        8.6         PEAK FLOW RATE(CFS) =      22.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.53   FLOW VELOCITY(FEET/SEC.) =  10.63
  LONGEST FLOWPATH FROM NODE     75.00 TO NODE     70.00 =    1883.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 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.) =    5.76
  RAINFALL INTENSITY(INCH/HR) =   7.21
  TOTAL STREAM AREA(ACRES) =     8.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      564.02    16.29        3.691         31.22
      2       22.85     5.76        7.214          8.62

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      222.37     5.76       7.214
      2      575.70    16.29       3.691

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     575.70   Tc(MIN.) =   16.29
  TOTAL AREA(ACRES) =       39.8
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     70.00 =    2940.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     68.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    335.00  DOWNSTREAM(FEET) =    323.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0160
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.533
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     579.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.96
  AVERAGE FLOW DEPTH(FEET) =   4.45   TRAVEL TIME(MIN.) =   1.14
  Tc(MIN.) =   17.43
  SUBAREA AREA(ACRES) =     7.12       SUBAREA RUNOFF(CFS) =    7.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  3.295
  TOTAL AREA(ACRES) =       47.0         PEAK FLOW RATE(CFS) =     575.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  4.44   FLOW VELOCITY(FEET/SEC.) =  10.93
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     68.00 =    3690.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       47.0  TC(MIN.) =     17.43
  PEAK FLOW RATE(CFS)   =     575.70
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

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Job Name: Sweetwater Vistas

Date: 7/10/15

Job #: 2780-002

Run Name:
E2.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
50	48	2	440.6	440	55	0.9	0.07				
48	42	6	440.0	362.0	1,750	0.9	2.49	ONE SIDE			
42	42	1						1 OF 2			
46	44	2	442.3	442.0	50	0.35	0.12				
44	42	5	442.0	362.0	1,300	0.31	3.90				
42	42	1						2 OF 2			
42	36	6	362.0	313.0	800	0.6	2.34	50% IMP. 1 SIDE			
36	36	1									
40	38	2	390.5	390.0	55	0.9	0.07				
38	36	6	390.0	313.0	930	0.9	1.19	ONE SIDE			
36	36	1						2 OF 2			
36	34	6	313.0	296.0	375	0.54	1.00	40% IMP			
							11.18				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2010 Advanced Engineering Software (aes)
             Ver. 17.0 Release Date: 07/01/2010  License ID 1355

                           Analysis prepared by:

                           FUSCOE ENGINEERING INC



 ************************** DESCRIPTION OF STUDY ***************************
* SWEETWATER VISTAS                                                        *
* EXISTING HYDROLOGY                                                       *
* RUN 2                                                                    *
 ***************************************************************************

  FILE NAME: E2.DAT
  TIME/DATE OF STUDY: 15:17 07/10/2015
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     48.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    440.60
  DOWNSTREAM ELEVATION(FEET) =    440.00
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.594
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     48.00 TO NODE     42.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  440.00  DOWNSTREAM ELEVATION(FEET) =  362.00
  STREET LENGTH(FEET) =  1750.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.05
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.78
  STREET FLOW TRAVEL TIME(MIN.) =   5.77   Tc(MIN.) =    8.36
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.674
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    2.49      SUBAREA RUNOFF(CFS) =   12.72
  TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =      13.07

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.49
  FLOW VELOCITY(FEET/SEC.) =  5.89   DEPTH*VELOCITY(FT*FT/SEC.) =   2.45
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     42.00 =    1805.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     42.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.36
  RAINFALL INTENSITY(INCH/HR) =   5.67
  TOTAL STREAM AREA(ACRES) =     2.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.07

****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     44.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    442.30
  DOWNSTREAM ELEVATION(FEET) =    442.00
  ELEVATION DIFFERENCE(FEET) =      0.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.318
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.667
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     42.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    442.00  DOWNSTREAM(FEET) =    362.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1300.00   CHANNEL SLOPE =  0.0615
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.561
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.68
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   5.89
  Tc(MIN.) =   17.21
  SUBAREA AREA(ACRES) =     3.90       SUBAREA RUNOFF(CFS) =    4.31
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.311
  TOTAL AREA(ACRES) =        4.0         PEAK FLOW RATE(CFS) =       4.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   4.63
  LONGEST FLOWPATH FROM NODE     46.00 TO NODE     42.00 =    1350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     42.00 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.) =   17.21
  RAINFALL INTENSITY(INCH/HR) =   3.56
  TOTAL STREAM AREA(ACRES) =     4.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.46

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.07     8.36        5.674          2.56
      2        4.46    17.21        3.561          4.02

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       15.24     8.36       5.674
      2       12.66    17.21       3.561
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.24   Tc(MIN.) =    8.36
  TOTAL AREA(ACRES) =        6.6
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     42.00 =    1805.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     36.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  362.00  DOWNSTREAM ELEVATION(FEET) =  313.00
  STREET LENGTH(FEET) =   800.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.74
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.44
    HALFSTREET FLOOD WIDTH(FEET) =   15.74
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.22
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.18
  STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =   10.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.989
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.556
  SUBAREA AREA(ACRES) =    2.34      SUBAREA RUNOFF(CFS) =    7.00
  TOTAL AREA(ACRES) =        8.9        PEAK FLOW RATE(CFS) =      24.74

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.48   HALFSTREET FLOOD WIDTH(FEET) =  17.54
  FLOW VELOCITY(FEET/SEC.) =  7.74   DEPTH*VELOCITY(FT*FT/SEC.) =   3.69
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     36.00 =    2605.00 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.) =   10.21
  RAINFALL INTENSITY(INCH/HR) =   4.99
  TOTAL STREAM AREA(ACRES) =     8.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.74

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     38.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    390.50
  DOWNSTREAM ELEVATION(FEET) =    390.00
  ELEVATION DIFFERENCE(FEET) =     0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.756
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     36.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  390.00  DOWNSTREAM ELEVATION(FEET) =  313.00
  STREET LENGTH(FEET) =   930.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.68
  STREET FLOW TRAVEL TIME(MIN.) =   2.66   Tc(MIN.) =    5.41
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.510
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    1.19      SUBAREA RUNOFF(CFS) =    8.04
  TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       8.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.74
  FLOW VELOCITY(FEET/SEC.) =  6.69   DEPTH*VELOCITY(FT*FT/SEC.) =   2.28
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     36.00 =     985.00 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.) =    5.41
  RAINFALL INTENSITY(INCH/HR) =   7.51
  TOTAL STREAM AREA(ACRES) =     1.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.52
```

```
** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1       24.74    10.21        4.989          8.92
    2        8.52     5.41        7.510          1.26

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1       24.95     5.41       7.510
    2       30.40    10.21       4.989

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      30.40   Tc(MIN.) =   10.21
TOTAL AREA(ACRES) =       10.2
LONGEST FLOWPATH FROM NODE     50.00 TO NODE     36.00 =    2605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     34.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  313.00  DOWNSTREAM ELEVATION(FEET) =  296.00
  STREET LENGTH(FEET) =   375.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      31.67
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.54
    HALFSTREET FLOOD WIDTH(FEET) =   22.33
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.27
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.90
  STREET FLOW TRAVEL TIME(MIN.) =   0.86   Tc(MIN.) =   11.07
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.735
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.593
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    2.56
  TOTAL AREA(ACRES) =       11.2        PEAK FLOW RATE(CFS) =      31.41

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  22.17
  FLOW VELOCITY(FEET/SEC.) =  7.27   DEPTH*VELOCITY(FT*FT/SEC.) =   3.89
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     34.00 =    2980.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       11.2  TC(MIN.) =     11.07
  PEAK FLOW RATE(CFS)   =      31.41
============================================================================
```

```
===============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

APPENDIX 4: AES PROPOSED HYDROLOGY ANALYSIS
(SEE APPENDIX 7-PROPOSED DRAINAGE MAP)

Job Name: Sweetwater Vistas

Date: 8/09/16

Job #: 2780-002

Run Name:
P1.DAT

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
99	98	2	490	488	70	0.9	0.07				
98	97	6	488	464	430	0.82	0.46	1 SIDE OF STREET			
97	97	1						1 OF 2			
96	95	2	489	489	40	0.9	0.04				
95	97	6	489	464	435	0.82	0.31	1 SIDE OF STREET			
97	97	1						2 OF 2			
97	94	3	458	446	410						
94	94	1						1 OF 3			
93	92	2	464	463	70	0.81	0.12				
92	94	6	463	454	328	0.81	0.56	1 SIDE OF STREET			
94	94	1						2 OF 3			
91	90	2	464	463	75	0.81	0.05				
90	94	6	463	454	328	0.81	0.23	1 SIDE OF STREET			
94	94	1						3 OF 3			
94	89	3	448	415	308						
89	89	1						1 OF 3			
88	87	2	454	451	41	0.81	0.06				
87	89	6	451	431	183	0.81	0.16	1 SIDE OF STREET			
89	89	1						2 OF 3			
86	85	2	454	451	41	0.81	0.03				
85	89	6	451	431	175	0.81	0.12	1 SIDE OF STREET			
89	89	1						3			
89	84	3	425	389.5	435						
84	84	1						1 OF 3			
83	82	2	431	423	75	0.81	0.05				
82	84	6	423	384	520	0.81	0.64	1 SIDE OF STREET			
84	84	1						2 OF 3			
81	80	2	431	423	70	0.81	0.05				
80	84	6	423	390	565	0.81	0.42	1 SIDE OF STREET			
84	84	1						3 OF 3			
84	79.9	3	384	373	40						
79.9	79.9	10						SAVE BANK 1	▨		

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Job Name: Sweetwater Vistas
Date: 8/09/16

Job #: 2780-002
Run Name:
P1.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
79.8	79.7	2	517	486	90	0.3	0.05		▨		
79.7	79.6	5	486	410	555	0.3	0.43		▨		
79.6	79.5	3	408	399	225				▨		
79.5	79.5	1						1 OF 2	▨		
									▨		
79.4	79.3	2	443	416	75	0.69	0.08		▨		
79.3	79.5	5	416	399	475	0.69	3.23		▨		
79.5	79.5	1						2 OF 2	▨		
									▨		
79.5	79.9	3	399	373	170				▨		
79.9	79.9	11						ADD BANK 1	▨		
79.9	79.9	12						CLEAR BANK 1			
79.9	79	3	373.0	368.0	175						
79	36	5	368.0	335.0	183	0.3					
36	36	10						SAVE BANK 1	▨		
									▨		
74	73	2	491	483	70	0.35	0.08		▨		
73	67.9	5	483	418	1040	0.35	1.22		▨		
67.9	67.9	1						1 OF 2	▨		
									▨		
63	62	2	464	458	80	0.69	0.08		▨		
62	67.8	5	458	453	355	0.69	1.87		▨		
67.8	67.9	3	452	421	185				▨		
67.9	67.9	1						2 of 2	▨		
									▨		
67.9	67	5	421	386	105		*		▨		
67	67	1						1 of 3	▨		
									▨		
78	77	2	443.8	443.2	55	0.9	0.12		▨		
77	76	6	443.2	440	440	0.9	0.63	1 sided	▨		
76	67	5	440	386	370	0.35	1.36		▨		
67	67	1						2 of 3	▨		
									▨		
67.5	67.5	7	Q=500 cfs Tc=15 min A=0						▨		
67.5	67	5	415	386	190		*		▨		
67	67	1						3 of 3	▨		
									▨		
									▨		

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Job Name: Sweetwater Vistas

Date: 8/09/16

Job #: 2780-002

Run Name:
P1.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
67	75	5	392	351	695	0.35	3.97		▨		
75	75	10						Save Bank 2	▨	▨	
									▨	▨	
68	66	2	449	411	118	0.3	0.08		▨	▨	
66	72	5	411	410	217	0.3	0.26		▨	▨	
72	72	1						1 of 3	▨	▨	
									▨	▨	
71	70	2	450	411	82	0.3	0.05		▨	▨	
70	72	5	411	410	124	0.3	0.13		▨	▨	
72	72	1						2 of 3	▨	▨	
									▨	▨	
72.9	72.8	2	460	456	80	0.69	0.08		▨	▨	
72.8	61	5	456	448	360	0.69	3.2		▨	▨	
61	72	3	443.0	410.0	95				▨	▨	
72	72	1						3 of 3	▨	▨	
									▨	▨	
72	64	3	410	377	95				▨	▨	
64	75	5	377	351	150	0.32	0.27		▨	▨	
75	75	11						Add Bank 2	▨	▨	
75	75	12						Clear Bank 2	▨		
									▨		
75	60	5	351	350	70	0.35	0.61		▨		
60	60	1						1 OF 2	▨		
									▨		
59	58	2	440	438.5	75	0.71	0.19		▨		
58	57	5	438.5	428	830	0.70	5		▨		
57	56	3	428	378	170				▨		
56	60	5	373	350	108	0.35	*		▨		
60	60	1						2 OF 2	▨		
									▨		
60	55	5	350	337	280	0.35	1.57		▨		
55	55	10						SAVE BANK 2	▨	▨	
									▨	▨	
55.9	55.9	7	Q= 49.1 Tc= 10 MINS A= 0						▨	▨	
55.9	55.8	3	482	464	350				▨	▨	
55.8	55.8	1						1 OF 2	▨	▨	
									▨	▨	
54	53	2	561	542	75	0.35	0.07		▨	▨	
53	52	5	542	473	355	0.35	1.7		▨	▨	
52	55.8	3	467	464	45				▨	▨	
55.8	55.8	1						2 OF 2	▨	▨	
									▨	▨	
55.8	51	3	464	434	680				▨	▨	
51	51	10						SAVE BANK 3	▨	▨	▨

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Job Name: Sweetwater Vistas

Date: 8/09/16

Job #: 2780-002

Run Name:
P1.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
50	49	2	606.4	604.5	40	0.9	0.08		▨	▨	▨
49	48	5	604.5	558.1	350	0.9	2.45		▨	▨	▨
48	47	3	552.1	546.2	195				▨	▨	▨
47	46	5	552.2	444	525	0.33	1.67		▨	▨	▨
46	46	1						1 OF 2	▨	▨	▨
									▨	▨	▨
45	44	2	606.4	603.5	93.5	0.9	0.16		▨	▨	▨
44	43	5	603.5	570.6	310	0.9	2.02		▨	▨	▨
43	42	3	564.6	559	95				▨	▨	▨
42	46	5	565	444	505	0.3	1.98		▨	▨	▨
46	46	1						2 OF 2	▨	▨	▨
									▨	▨	▨
46	51	3	438	434	50				▨	▨	▨
51	51	11						ADD BANK 3	▨	▨	▨
51	51	12						CLEAR BANK 3	▨	▨	
									▨	▨	
51	41	3	434	399	235				▨	▨	
41	37	5	399	385	115				▨	▨	
37	37	1						1 OF 2	▨	▨	
									▨	▨	
39	38	2	452	434	75	0.3	0.06		▨	▨	
38	37	5	434	385	215	0.3	1.08		▨	▨	
37	37	1						2 of 2	▨	▨	
									▨	▨	
37	55	5	385	336	420	0.3	2.40		▨	▨	
55	55	11						ADD BANK 2	▨	▨	
55	55	12						CLEAR BANK 2	▨		
									▨		
55	36	5	336	335	60	0.3	*		▨		
36	36	11						ADD BANK 1	▨		
36	36	12						CLEAR BANK 1			
36	35	5	335	314	760	0.34	7.93				
							49.53				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                     6390 Greenwich Drive, Suite 170
                               San Diego, CA
                                   92122

 ************************** DESCRIPTION OF STUDY **************************
* SWEETWATER VISTAS                                                        *
* PROPOSED HYDROLOGY - NO DETENTION                                        *
* RUN 1                                                                    *
 **************************************************************************

  FILE NAME: P1.DAT
  TIME/DATE OF STUDY: 09:05 08/10/2016
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===   =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     99.00 TO NODE     98.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    490.00
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.123
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     98.00 TO NODE     97.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  488.00  DOWNSTREAM ELEVATION(FEET) =  464.00
  STREET LENGTH(FEET) =   430.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.98
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.18
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
  STREET FLOW TRAVEL TIME(MIN.) =   1.72   Tc(MIN.) =    3.84
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.831
  SUBAREA AREA(ACRES) =    0.46      SUBAREA RUNOFF(CFS) =    2.98
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       3.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.91
  FLOW VELOCITY(FEET/SEC.) =  4.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.33
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     97.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     97.00 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.) =    3.84
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.48

****************************************************************************
  FLOW PROCESS FROM NODE     96.00 TO NODE     95.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    489.00
  DOWNSTREAM ELEVATION(FEET) =    488.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.114
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE     95.00 TO NODE     97.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  488.50  DOWNSTREAM ELEVATION(FEET) =  464.00
```

```
  STREET LENGTH(FEET) =   435.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
  STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =    3.96
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.829
  SUBAREA AREA(ACRES) =    0.31      SUBAREA RUNOFF(CFS) =    2.01
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       2.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.45
  FLOW VELOCITY(FEET/SEC.) =  4.30   DEPTH*VELOCITY(FT*FT/SEC.) =   1.10
  LONGEST FLOWPATH FROM NODE     96.00 TO NODE     97.00 =     475.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     97.00 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.) =    3.96
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.29

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
```

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.48     3.84        7.904          0.53
      2        2.29     3.96        7.904          0.35

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.70     3.84       7.904
      2        5.77     3.96       7.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.77   Tc(MIN.) =    3.96
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     97.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     94.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   458.00  DOWNSTREAM(FEET) =   446.00
  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   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.72
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =    4.75
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     94.00 =     910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 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.) =    4.75
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

****************************************************************************
  FLOW PROCESS FROM NODE     93.00 TO NODE     92.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.878
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE     92.00 TO NODE     94.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  463.00  DOWNSTREAM ELEVATION(FEET) =  454.00
  STREET LENGTH(FEET) =   328.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.45
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.30
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   1.66   Tc(MIN.) =    5.54
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.402
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.56      SUBAREA RUNOFF(CFS) =    3.36
```

```
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       4.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.90
  FLOW VELOCITY(FEET/SEC.) =  3.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.20
  LONGEST FLOWPATH FROM NODE     93.00 TO NODE     94.00 =     398.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.54
  RAINFALL INTENSITY(INCH/HR) =   7.40
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.08

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE     90.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.968
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     94.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  463.00  DOWNSTREAM ELEVATION(FEET) =  454.00
```

```
  STREET LENGTH(FEET) =   328.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.85
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.77
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.62
  STREET FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    5.94
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.071
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.23      SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.45
  FLOW VELOCITY(FEET/SEC.) =  3.00   DEPTH*VELOCITY(FT*FT/SEC.) =   0.77
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     94.00 =     403.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 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.) =    5.94
  RAINFALL INTENSITY(INCH/HR) =   7.07
  TOTAL STREAM AREA(ACRES) =     0.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
     1        5.77     4.75        7.904          0.88
     2        4.08     5.54        7.402          0.68
     3        1.60     5.94        7.071          0.28

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       10.55     4.75       7.904
     2       10.98     5.54       7.402
     3       10.66     5.94       7.071

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.98   Tc(MIN.) =    5.54
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     94.00 =     910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     89.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   448.00  DOWNSTREAM(FEET) =   415.00
  FLOW LENGTH(FEET) =   308.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.65
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.98
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    5.84
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     89.00 =    1218.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.84
  RAINFALL INTENSITY(INCH/HR) =   7.15
  TOTAL STREAM AREA(ACRES) =     1.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.98

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

```
  FLOW PROCESS FROM NODE     88.00 TO NODE     87.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    454.00
  DOWNSTREAM ELEVATION(FEET) =    451.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.848
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE     87.00 TO NODE     89.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  451.00  DOWNSTREAM ELEVATION(FEET) =  431.00
  STREET LENGTH(FEET) =   183.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.17
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   0.54   Tc(MIN.) =    3.39
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    1.02
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.41

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.86
  FLOW VELOCITY(FEET/SEC.) =  5.28   DEPTH*VELOCITY(FT*FT/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE     88.00 TO NODE     89.00 =     258.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 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.) =    3.39
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.41

****************************************************************************
  FLOW PROCESS FROM NODE     86.00 TO NODE     85.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    41.00
  UPSTREAM ELEVATION(FEET) =    454.00
  DOWNSTREAM ELEVATION(FEET) =    451.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.722
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE     85.00 TO NODE     89.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  451.00  DOWNSTREAM ELEVATION(FEET) =  431.00
  STREET LENGTH(FEET) =   175.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00
```

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.38
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   0.46   Tc(MIN.) =    2.18
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.77
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.17   HALFSTREET FLOOD WIDTH(FEET) =   2.33
  FLOW VELOCITY(FEET/SEC.) =  5.57   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE     86.00 TO NODE     89.00 =     216.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 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.) =    2.18
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.98     5.84        7.148          1.84
```

```
    2        1.41     3.39        7.904          0.22
    3        0.96     2.18        7.904          0.15

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        11.79     2.18       7.904
    2        12.30     3.39       7.904
    3        13.12     5.84       7.148

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.12   Tc(MIN.) =    5.84
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     89.00 =    1218.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     84.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   425.00  DOWNSTREAM(FEET) =   389.50
  FLOW LENGTH(FEET) =   435.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.78
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.12
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     84.00 =    1653.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 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.) =    6.30
  RAINFALL INTENSITY(INCH/HR) =   6.81
  TOTAL STREAM AREA(ACRES) =     2.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.12

****************************************************************************
  FLOW PROCESS FROM NODE     83.00 TO NODE     82.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    431.00
  DOWNSTREAM ELEVATION(FEET) =    423.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.098
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     84.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  423.00  DOWNSTREAM ELEVATION(FEET) =  384.00
  STREET LENGTH(FEET) =   520.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.05
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.21
  STREET FLOW TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =    3.87
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    4.10
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       4.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.24
  FLOW VELOCITY(FEET/SEC.) =  5.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.61
  LONGEST FLOWPATH FROM NODE     83.00 TO NODE     84.00 =     595.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 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.) =    3.87
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.42

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE     80.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
   *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    431.00
  DOWNSTREAM ELEVATION(FEET) =    423.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.027
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     84.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  423.00  DOWNSTREAM ELEVATION(FEET) =  390.00
  STREET LENGTH(FEET) =   565.00   CURB HEIGHT(INCHES) =  6.0
```

```
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.66
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
  STREET FLOW TRAVEL TIME(MIN.) =   2.27   Tc(MIN.) =    4.30
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    2.69
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       3.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.31
  FLOW VELOCITY(FEET/SEC.) =  4.61   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
  LONGEST FLOWPATH FROM NODE     81.00 TO NODE     84.00 =     635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 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.) =    4.30
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.01

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
    1       13.12     6.30        6.807          2.21
    2        4.42     3.87        7.904          0.69
    3        3.01     4.30        7.904          0.47

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.43     3.87       7.904
      2       18.73     4.30       7.904
      3       19.52     6.30       6.807

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.52   Tc(MIN.) =    6.30
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     84.00 =    1653.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     79.90 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   384.00  DOWNSTREAM(FEET) =   373.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.52
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    6.33
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     79.90 =    1693.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.90 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     79.80 TO NODE     79.70 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =    517.00
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =     31.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.341
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.781
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     79.70 TO NODE     79.60 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   555.00   CHANNEL SLOPE =  0.1369
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.027
   *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.47
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   3.74
  Tc(MIN.) =   10.09
  SUBAREA AREA(ACRES) =     0.43       SUBAREA RUNOFF(CFS) =    0.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.13
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.60 =     645.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.60 TO NODE     79.50 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   407.50  DOWNSTREAM(FEET) =   399.00
  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.) =   5.26
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.72
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =   10.80
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.50 =     870.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.50 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.) =   10.80
  RAINFALL INTENSITY(INCH/HR) =   4.81
  TOTAL STREAM AREA(ACRES) =     0.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE     79.40 TO NODE     79.30 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    443.00
  DOWNSTREAM ELEVATION(FEET) =    416.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.967
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     79.30 TO NODE     79.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    416.00  DOWNSTREAM(FEET) =    399.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   475.00   CHANNEL SLOPE =  0.0358
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.24
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.82
  AVERAGE FLOW DEPTH(FEET) =   0.48   TRAVEL TIME(MIN.) =   1.64
  Tc(MIN.) =    4.61
  SUBAREA AREA(ACRES) =     3.23       SUBAREA RUNOFF(CFS) =   17.62
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =      18.05

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.70   FLOW VELOCITY(FEET/SEC.) =   5.89
  LONGEST FLOWPATH FROM NODE     79.40 TO NODE     79.50 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.50 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.) =    4.61
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     3.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.05

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.72    10.80        4.810          0.48
      2       18.05     4.61        7.904          3.31

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.36     4.61       7.904
      2       11.71    10.80       4.810

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.36   Tc(MIN.) =    4.61
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.50 =     870.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.90 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   399.00  DOWNSTREAM(FEET) =   373.00
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.73
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.36
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    4.74
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.90 =    1040.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.90 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       18.36     4.74       7.904        3.79
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.90 =    1040.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       19.52     6.33       6.790        3.37
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     79.90 =    1693.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      32.98       4.74        7.904
      2      35.29       6.33        6.790

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.29   Tc(MIN.) =    6.33
  TOTAL AREA(ACRES) =        7.2

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.90 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   373.00  DOWNSTREAM(FEET) =   368.00
  FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.16
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.29
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    6.55
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     79.00 =    1868.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.00 TO NODE     36.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    368.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   183.00   CHANNEL SLOPE =  0.1803
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1502 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      35.29
  FLOW VELOCITY(FEET/SEC) =   7.11 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.43   Tc(MIN.) =    6.98
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     36.00 =    2051.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     73.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    491.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.243
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.666
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE     73.00 TO NODE     67.90 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    418.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1040.00   CHANNEL SLOPE =  0.0625
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.714
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.94
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   5.90
  Tc(MIN.) =   11.14
  SUBAREA AREA(ACRES) =     1.22       SUBAREA RUNOFF(CFS) =    2.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       2.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   3.58
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.90 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.90 TO NODE     67.90 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.) =   11.14
  RAINFALL INTENSITY(INCH/HR) =   4.71
  TOTAL STREAM AREA(ACRES) =     1.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.15

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     62.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =   464.00
  DOWNSTREAM ELEVATION(FEET) =   458.00
  ELEVATION DIFFERENCE(FEET) =     6.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.372
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     67.80 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    458.00  DOWNSTREAM(FEET) =    453.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   355.00   CHANNEL SLOPE =  0.0141
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.537
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.94
  AVERAGE FLOW DEPTH(FEET) =   0.46   TRAVEL TIME(MIN.) =   2.01
  Tc(MIN.) =    5.38
  SUBAREA AREA(ACRES) =     1.87       SUBAREA RUNOFF(CFS) =    9.73
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =      10.14

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.65   FLOW VELOCITY(FEET/SEC.) =   3.60
  LONGEST FLOWPATH FROM NODE     63.00 TO NODE     67.80 =     435.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.80 TO NODE     67.90 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   452.00  DOWNSTREAM(FEET) =   421.00
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.15
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.14
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    5.54
  LONGEST FLOWPATH FROM NODE     63.00 TO NODE     67.90 =     620.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.90 TO NODE     67.90 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.) =    5.54
  RAINFALL INTENSITY(INCH/HR) =   7.40
  TOTAL STREAM AREA(ACRES) =     1.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.14

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         2.15    11.14        4.714          1.30
     2        10.14     5.54        7.395          1.95

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        11.21     5.54       7.395
     2         8.61    11.14       4.714

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.21   Tc(MIN.) =    5.54
  TOTAL AREA(ACRES) =        3.2
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.90 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.90 TO NODE     67.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    421.00  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.3333
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2023 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      11.21
  FLOW VELOCITY(FEET/SEC) =   5.63 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.31   Tc(MIN.) =    5.85
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     67.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.85
  RAINFALL INTENSITY(INCH/HR) =   7.14
  TOTAL STREAM AREA(ACRES) =     3.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.21

****************************************************************************
  FLOW PROCESS FROM NODE     78.00 TO NODE     77.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    443.80
  DOWNSTREAM ELEVATION(FEET) =    443.20
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.594
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE     77.00 TO NODE     76.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  443.20  DOWNSTREAM ELEVATION(FEET) =  440.00
  STREET LENGTH(FEET) =   440.00   CURB HEIGHT(INCHES) =  6.0
```

```
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.72
  STREET FLOW TRAVEL TIME(MIN.) =   3.57   Tc(MIN.) =    6.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.905
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    0.63      SUBAREA RUNOFF(CFS) =    3.92
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.79
  FLOW VELOCITY(FEET/SEC.) =  2.31   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE     78.00 TO NODE     76.00 =     495.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     67.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    440.00  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   370.00   CHANNEL SLOPE =  0.1459
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.325
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.86
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   0.90
```

```
  Tc(MIN.) =    7.06
  SUBAREA AREA(ACRES) =     1.36       SUBAREA RUNOFF(CFS) =    3.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.545
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       7.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   7.15
  LONGEST FLOWPATH FROM NODE     78.00 TO NODE     67.00 =     865.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     67.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.06
  RAINFALL INTENSITY(INCH/HR) =   6.32
  TOTAL STREAM AREA(ACRES) =     2.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.28

****************************************************************************
  FLOW PROCESS FROM NODE     67.50 TO NODE     67.50 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  15.00   RAIN INTENSITY(INCH/HOUR) =  3.89
  TOTAL AREA(ACRES) =     0.00   TOTAL RUNOFF(CFS) =    500.00

****************************************************************************
  FLOW PROCESS FROM NODE     67.50 TO NODE     67.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    415.00  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.1526
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1363 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =     500.00
  FLOW VELOCITY(FEET/SEC) =  16.38 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.19   Tc(MIN.) =   15.19
  LONGEST FLOWPATH FROM NODE     81.00 TO NODE     67.00 =     825.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     67.00 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.) =   15.19
  RAINFALL INTENSITY(INCH/HR) =   3.86
  TOTAL STREAM AREA(ACRES) =     0.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    500.00

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       11.21     5.85        7.140          3.25
      2        7.28     7.06        6.325          2.11
      3      500.00    15.19        3.859          0.00

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      209.90     5.85       7.140
      2      249.68     7.06       6.325
      3      510.50    15.19       3.859

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     510.50   Tc(MIN.) =   15.19
  TOTAL AREA(ACRES) =        5.4
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     75.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    392.00  DOWNSTREAM(FEET) =    351.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   695.00   CHANNEL SLOPE =  0.0590
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.754
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     513.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  17.32
```

```
  AVERAGE FLOW DEPTH(FEET) =   3.17   TRAVEL TIME(MIN.) =   0.67
  Tc(MIN.) =   15.86
  SUBAREA AREA(ACRES) =     3.97       SUBAREA RUNOFF(CFS) =    5.22
  AREA-AVERAGE RUNOFF COEFFICIENT = 14.236
  TOTAL AREA(ACRES) =        9.3         PEAK FLOW RATE(CFS) =     510.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.16   FLOW VELOCITY(FEET/SEC.) =  17.30
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     75.00 =    1910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     68.00 TO NODE     66.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   118.00
  UPSTREAM ELEVATION(FEET) =    449.00
  DOWNSTREAM ELEVATION(FEET) =    411.00
  ELEVATION DIFFERENCE(FEET) =     38.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.684
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.554
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE     66.00 TO NODE     72.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    411.00  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   217.00   CHANNEL SLOPE =  0.0046
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.693
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.80
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   4.53
  Tc(MIN.) =   11.22
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE     68.00 TO NODE     72.00 =     335.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 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.) =   11.22
  RAINFALL INTENSITY(INCH/HR) =   4.69
  TOTAL STREAM AREA(ACRES) =     0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     70.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    82.00
  UPSTREAM ELEVATION(FEET) =    450.00
  DOWNSTREAM ELEVATION(FEET) =    411.00
  ELEVATION DIFFERENCE(FEET) =     39.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.053
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.988
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     72.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    411.00  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   124.00   CHANNEL SLOPE =  0.0081
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.604
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.84
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   2.47
  Tc(MIN.) =    8.52
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.30

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE     71.00 TO NODE     72.00 =     206.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 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.) =    8.52
  RAINFALL INTENSITY(INCH/HR) =   5.60
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE     72.90 TO NODE     72.80 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    460.00
  DOWNSTREAM ELEVATION(FEET) =    456.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.860
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     72.80 TO NODE     61.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    456.00  DOWNSTREAM(FEET) =    448.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   360.00   CHANNEL SLOPE =  0.0222
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.567
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.03
  AVERAGE FLOW DEPTH(FEET) =   0.54   TRAVEL TIME(MIN.) =   1.49
  Tc(MIN.) =    5.35
  SUBAREA AREA(ACRES) =     3.20       SUBAREA RUNOFF(CFS) =   16.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =      17.13

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.77   FLOW VELOCITY(FEET/SEC.) =   4.92
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     61.00 =     440.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     72.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   443.00  DOWNSTREAM(FEET) =   410.00
  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   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  28.83
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.13
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.40
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     72.00 =     535.00 FEET.

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

```
  FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 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.) =    5.40
  RAINFALL INTENSITY(INCH/HR) =   7.52
  TOTAL STREAM AREA(ACRES) =     3.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.13

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.48    11.22        4.693          0.34
      2        0.30     8.52        5.604          0.18
      3       17.13     5.40        7.518          3.28

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       17.55     5.40       7.518
      2       13.43     8.52       5.604
      3       11.42    11.22       4.693

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.55   Tc(MIN.) =    5.40
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     72.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     64.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   410.00  DOWNSTREAM(FEET) =   377.00
  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   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  29.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.55
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.46
```

```
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     64.00 =     630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     75.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    377.00  DOWNSTREAM(FEET) =    351.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00   CHANNEL SLOPE =  0.1733
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.262
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.25
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   0.24
  Tc(MIN.) =    5.70
  SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =    0.63
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.616
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =      18.19

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =  10.28
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     75.00 =     780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       18.19     5.70       7.262        4.07
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     75.00 =     780.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      510.50    15.86       3.754        9.33
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     75.00 =    1910.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
```

```
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     201.72       5.70        7.262
      2     519.91      15.86        3.754

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     519.91   Tc(MIN.) =   15.86
  TOTAL AREA(ACRES) =       13.4

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     60.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    351.00  DOWNSTREAM(FEET) =    350.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0143
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.736
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     520.31
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.22
  AVERAGE FLOW DEPTH(FEET) =   4.35   TRAVEL TIME(MIN.) =   0.11
  Tc(MIN.) =   15.98
  SUBAREA AREA(ACRES) =     0.61       SUBAREA RUNOFF(CFS) =    0.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  9.675
  TOTAL AREA(ACRES) =       14.0         PEAK FLOW RATE(CFS) =     519.91

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  4.35   FLOW VELOCITY(FEET/SEC.) =  10.21
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     60.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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.) =   15.98
```

```
  RAINFALL INTENSITY(INCH/HR) =   3.74
  TOTAL STREAM AREA(ACRES) =    14.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    519.91

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     58.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    440.00
  DOWNSTREAM ELEVATION(FEET) =    438.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.07
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      1.07

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     57.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    438.50  DOWNSTREAM(FEET) =    428.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   830.00   CHANNEL SLOPE =  0.0127
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.511
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.53
  AVERAGE FLOW DEPTH(FEET) =   0.70   TRAVEL TIME(MIN.) =   3.92
  Tc(MIN.) =    8.74
  SUBAREA AREA(ACRES) =     5.00       SUBAREA RUNOFF(CFS) =   19.29
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.700
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      20.03

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.97   FLOW VELOCITY(FEET/SEC.) =   4.20
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     57.00 =     905.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     56.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   428.00  DOWNSTREAM(FEET) =   378.00
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  28.30
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.03
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    8.84
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     56.00 =    1075.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     56.00 TO NODE     60.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    373.00  DOWNSTREAM(FEET) =    350.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   108.00   CHANNEL SLOPE =  0.2130
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1665 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      20.03
  FLOW VELOCITY(FEET/SEC) =   6.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.29   Tc(MIN.) =    9.14
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     60.00 =    1183.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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.) =    9.14
  RAINFALL INTENSITY(INCH/HR) =   5.36
  TOTAL STREAM AREA(ACRES) =     5.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.03

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      519.91    15.98        3.736         14.01
```

```
    2       20.03     9.14        5.358          5.19

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      317.32     9.14       5.358
      2      533.88    15.98       3.736

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     533.88   Tc(MIN.) =   15.98
  TOTAL AREA(ACRES) =       19.2
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     60.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     55.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    350.00  DOWNSTREAM(FEET) =    337.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   280.00   CHANNEL SLOPE =  0.0464
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.693
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     534.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  15.99
  AVERAGE FLOW DEPTH(FEET) =   3.41   TRAVEL TIME(MIN.) =   0.29
  Tc(MIN.) =   16.27
  SUBAREA AREA(ACRES) =     1.57       SUBAREA RUNOFF(CFS) =    2.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  6.727
  TOTAL AREA(ACRES) =       20.8         PEAK FLOW RATE(CFS) =     533.88

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.41   FLOW VELOCITY(FEET/SEC.) =  15.98
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    2260.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     55.90 TO NODE     55.90 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  10.00   RAIN INTENSITY(INCH/HOUR) =  5.05
  TOTAL AREA(ACRES) =     0.00   TOTAL RUNOFF(CFS) =     49.10

****************************************************************************
  FLOW PROCESS FROM NODE     55.90 TO NODE     55.80 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   464.00
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.33
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      49.10
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =   10.32
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.80 =    2610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.80 TO NODE     55.80 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.) =   10.32
  RAINFALL INTENSITY(INCH/HR) =   4.95
  TOTAL STREAM AREA(ACRES) =     0.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     49.10

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     53.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    561.00
  DOWNSTREAM ELEVATION(FEET) =    542.00
  ELEVATION DIFFERENCE(FEET) =     19.00
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.427
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.497
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     52.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    542.00  DOWNSTREAM(FEET) =    473.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   355.00   CHANNEL SLOPE =  0.1944
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.686
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.61
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.05
  Tc(MIN.) =    6.48
  SUBAREA AREA(ACRES) =     1.70       SUBAREA RUNOFF(CFS) =    3.98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       4.14

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   6.84
  LONGEST FLOWPATH FROM NODE     54.00 TO NODE     52.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     55.80 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) =   464.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.14
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    6.55
  LONGEST FLOWPATH FROM NODE     54.00 TO NODE     55.80 =     475.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     55.80 TO NODE     55.80 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.) =    6.55
  RAINFALL INTENSITY(INCH/HR) =   6.64
  TOTAL STREAM AREA(ACRES) =     1.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.14

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       49.10    10.32        4.954          0.00
      2        4.14     6.55        6.639          1.77

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       35.32     6.55       6.639
      2       52.19    10.32       4.954

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      52.19   Tc(MIN.) =   10.32
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.80 =    2610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.80 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   464.00  DOWNSTREAM(FEET) =   434.00
  FLOW LENGTH(FEET) =   680.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.41
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      52.19
  PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   10.97
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     51.00 =    3290.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     49.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    606.40
  DOWNSTREAM ELEVATION(FEET) =    604.50
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.355
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE     49.00 TO NODE     48.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    604.50  DOWNSTREAM(FEET) =    558.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.1326
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.61
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    2.12
  SUBAREA AREA(ACRES) =     2.45       SUBAREA RUNOFF(CFS) =   17.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =      18.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   9.34
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     48.00 =     390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     48.00 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) =   552.10  DOWNSTREAM(FEET) =   546.20
  FLOW LENGTH(FEET) =   195.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.72
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.00
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    2.40
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     47.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     46.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    552.20  DOWNSTREAM(FEET) =    444.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   525.00   CHANNEL SLOPE =  0.2061
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.34
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    3.17
  SUBAREA AREA(ACRES) =     1.67       SUBAREA RUNOFF(CFS) =    4.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.673
  TOTAL AREA(ACRES) =        4.2         PEAK FLOW RATE(CFS) =      22.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =  11.65
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     46.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =    3.17
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     4.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.35

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     44.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.50
  UPSTREAM ELEVATION(FEET) =    606.40
  DOWNSTREAM ELEVATION(FEET) =    603.50
  ELEVATION DIFFERENCE(FEET) =      2.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.387
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.14
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      1.14

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     43.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    603.50  DOWNSTREAM(FEET) =    570.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.1061
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.82
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   0.76
  Tc(MIN.) =    3.14
  SUBAREA AREA(ACRES) =     2.02       SUBAREA RUNOFF(CFS) =   14.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
```

```
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =      15.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =   8.25
  LONGEST FLOWPATH FROM NODE     45.00 TO NODE     43.00 =     403.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   564.60  DOWNSTREAM(FEET) =   559.00
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.53
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.51
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    3.25
  LONGEST FLOWPATH FROM NODE     45.00 TO NODE     42.00 =     498.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     46.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    565.00  DOWNSTREAM(FEET) =    444.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   505.00   CHANNEL SLOPE =  0.2396
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.43
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   0.74
  Tc(MIN.) =    3.99
  SUBAREA AREA(ACRES) =     1.98       SUBAREA RUNOFF(CFS) =    4.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.614
  TOTAL AREA(ACRES) =        4.2         PEAK FLOW RATE(CFS) =      20.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.44   FLOW VELOCITY(FEET/SEC.) =  11.85
  LONGEST FLOWPATH FROM NODE     45.00 TO NODE     46.00 =    1003.50 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =    3.99
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     4.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.20

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       22.35     3.17        7.904          4.20
      2       20.20     3.99        7.904          4.16

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       38.40     3.17       7.904
      2       42.56     3.99       7.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.56   Tc(MIN.) =    3.99
  TOTAL AREA(ACRES) =         8.4
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     46.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.00  DOWNSTREAM(FEET) =   434.00
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.91
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      42.56
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.03
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     51.00 =    1160.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       42.56     4.03       7.904        8.36
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     51.00 =    1160.00 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       52.19    10.97       4.762        1.77
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     51.00 =    3290.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      61.73       4.03        7.904
      2      77.83      10.97        4.762

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      77.83   Tc(MIN.) =   10.97
  TOTAL AREA(ACRES) =       10.1

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 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) =   434.00  DOWNSTREAM(FEET) =   399.00
  FLOW LENGTH(FEET) =   235.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  29.97
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      77.83
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   11.10
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     41.00 =    3525.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     37.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    399.00  DOWNSTREAM(FEET) =    385.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.1217
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1162 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      77.83
  FLOW VELOCITY(FEET/SEC) =   8.14 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.24   Tc(MIN.) =   11.34
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     37.00 =    3640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =   11.34
  RAINFALL INTENSITY(INCH/HR) =   4.66
  TOTAL STREAM AREA(ACRES) =    10.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     77.83

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     38.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    452.00
  DOWNSTREAM ELEVATION(FEET) =    434.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.789
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.192
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     37.00 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    434.00  DOWNSTREAM(FEET) =    385.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.2279
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.602
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.37
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   0.82
  Tc(MIN.) =    6.61
  SUBAREA AREA(ACRES) =     1.08       SUBAREA RUNOFF(CFS) =    2.14
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       2.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.56
  LONGEST FLOWPATH FROM NODE     39.00 TO NODE     37.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =    6.61
  RAINFALL INTENSITY(INCH/HR) =   6.60
  TOTAL STREAM AREA(ACRES) =     1.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.26

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       77.83    11.34        4.662         10.13
      2        2.26     6.61        6.602          1.14

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       47.63     6.61       6.602
      2       79.42    11.34       4.662

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      79.42   Tc(MIN.) =   11.34
  TOTAL AREA(ACRES) =       11.3
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     37.00 =    3640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     55.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    385.00  DOWNSTREAM(FEET) =    336.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   420.00   CHANNEL SLOPE =  0.1167
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.532
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      81.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.73
  AVERAGE FLOW DEPTH(FEET) =   1.12   TRAVEL TIME(MIN.) =   0.51
  Tc(MIN.) =   11.85
  SUBAREA AREA(ACRES) =     2.40       SUBAREA RUNOFF(CFS) =    3.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  1.227
  TOTAL AREA(ACRES) =       13.7         PEAK FLOW RATE(CFS) =      79.42

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.11   FLOW VELOCITY(FEET/SEC.) =  13.69
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    4060.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       79.42    11.85       4.532       13.67
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    4060.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
```

```
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      533.88    16.27       3.693       20.77
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    2260.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     468.15      11.85        4.532
      2     598.60      16.27        3.693

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     598.60   Tc(MIN.) =   16.27
  TOTAL AREA(ACRES) =       34.4

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     36.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    336.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    60.00   CHANNEL SLOPE =  0.0167
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0167 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =     598.60
  FLOW VELOCITY(FEET/SEC) =   6.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.16   Tc(MIN.) =   16.43
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     36.00 =    4120.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      598.60    16.43       3.669       34.44
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     36.00 =    4120.00 FEET.
```

```
  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       35.29     6.98       6.375        7.16
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     36.00 =    2051.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     289.49       6.98        6.375
      2     618.91      16.43        3.669

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     618.91   Tc(MIN.) =   16.43
  TOTAL AREA(ACRES) =       41.6

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    335.00  DOWNSTREAM(FEET) =    314.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   760.00   CHANNEL SLOPE =  0.0276
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.542
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     623.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.70
  AVERAGE FLOW DEPTH(FEET) =   4.08   TRAVEL TIME(MIN.) =   0.92
  Tc(MIN.) =   17.36
  SUBAREA AREA(ACRES) =     7.93       SUBAREA RUNOFF(CFS) =    9.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  3.319
  TOTAL AREA(ACRES) =       49.5         PEAK FLOW RATE(CFS) =     618.91

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  4.07   FLOW VELOCITY(FEET/SEC.) =  13.65
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     35.00 =    4880.00 FEET.
============================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       49.5  TC(MIN.) =     17.36
  PEAK FLOW RATE(CFS)   =     618.91
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

↑
```

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Job Name: Sweetwater Vistas

Date: 10/18/16

Job #: 2780-002

Run Name:
P1-d.DAT

See detention analysis for post detention Q determination (code 7's)

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
99	98	2	490	488	70	0.9	0.07				
98	97	6	488	464	430	0.82	0.46	1 SIDE OF STREET			
97	97	1						1 OF 2			
96	95	2	489	489	40	0.9	0.04				
95	97	6	489	464	435	0.82	0.31	1 SIDE OF STREET			
97	97	1						2 OF 2			
97	94	3	458	446	410						
94	94	1						1 OF 3			
93	92	2	464	463	70	0.81	0.12				
92	94	6	463	454	328	0.81	0.56	1 SIDE OF STREET			
94	94	1						2 OF 3			
91	90	2	464	463	75	0.81	0.05				
90	94	6	463	454	328	0.81	0.23	1 SIDE OF STREET			
94	94	1						3 OF 3			
94	89	3	448	415	308						
89	89	1						1 OF 3			
88	87	2	454	451	41	0.81	0.06				
87	89	6	451	431	183	0.81	0.16	1 SIDE OF STREET			
89	89	1						2 OF 3			
86	85	2	454	451	41	0.81	0.03				
85	89	6	451	431	175	0.81	0.12	1 SIDE OF STREET			
89	89	1						3			
89	84	3	425	389.5	435						
84	84	1						1 OF 3			
83	82	2	431	423	75	0.81	0.05				
82	84	6	423	384	520	0.81	0.64	1 SIDE OF STREET			
84	84	1						2 OF 3			
81	80	2	431	423	70	0.81	0.05				
80	84	6	423	390	565	0.81	0.42	1 SIDE OF STREET			
84	84	1						3 OF 3			
84	84	7	Tc=6.30 A=3.40 Q=1.04					DMA 4 POST DETENTION			
84	79.9	3	384	373	40						
79.9	79.9	10						SAVE BANK 1	▨		

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Date: 8/09/16

Job #: 2780-002

Run Name:
P1-d.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
79.8	79.7	2	517	486	90	0.3	0.05		▨		
79.7	79.6	5	486	410	555	0.3	0.43		▨		
79.6	79.5	3	408	399	225				▨		
79.5	79.5	1						1 OF 2	▨		
									▨		
79.4	79.3	2	443	416	75	0.69	0.08		▨		
79.3	79.5	5	416	399	475	0.69	3.23		▨		
79.5	79.5	7	Tc=5.00 A=3.30 Q=2.06					DMA 2 POST DETENTION	▨		
79.5	79.5	1						2 OF 2	▨		
79.5	79.9	3	399	373	170				▨		
79.9	79.9	11						ADD BANK 1	▨		
79.9	79.9	12						CLEAR BANK 1			
79.9	79	3	373.0	368.0	175						
79	36	5	368.0	335.0	183	0.3					
36	36	10						SAVE BANK 1	▨		
									▨		
74	73	2	491	483	70	0.35	0.08		▨		
73	67.9	5	483	418	1040	0.35	1.22		▨		
67.9	67.9	1						1 OF 2	▨		
									▨		
63	62	2	464	458	80	0.69	0.08		▨		
62	67.8	5	458	453	355	0.69	1.87		▨		
67.8	67.8	7	Tc=5.38 A=2.0 Q=1.73					DMA 1.3 POST DETENTION	▨		
67.8	67.9	3	452	421	185				▨		
67.9	67.9	1						2 of 2	▨		
67.9	67	5	421	386	105		*		▨		
67	67	1						1 of 3	▨		
									▨		
78	77	2	443.8	443.2	55	0.9	0.12		▨		
77	76	6	443.2	440	440	0.9	0.63	1 sided	▨		
76	67	5	440	386	370	0.35	1.36		▨		
67	67	1						2 of 3	▨		
									▨		
67.5	67.5	7	Q=500 cfs Tc=15 min A=0					Incoming SD from offsite	▨		
67.5	67	5	415	386	190		*		▨		
67	67	1						3 of 3	▨		
									▨		
									▨		

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Date: 8/09/16

Job #: 2780-002

Run Name:
P1-d.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
67	75	5	392	351	695	0.35	3.97		▨		
75	75	10						Save Bank 2	▨	▨	
									▨	▨	
68	66	2	449	411	118	0.3	0.08		▨	▨	
66	72	5	411	410	217	0.3	0.26		▨	▨	
72	72	1						1 of 3	▨	▨	
									▨	▨	
71	70	2	450	411	82	0.3	0.05		▨	▨	
70	72	5	411	410	124	0.3	0.13		▨	▨	
72	72	1						2 of 3	▨	▨	
									▨	▨	
72.9	72.8	2	460	456	80	0.69	0.08		▨	▨	
72.8	61	5	456	448	360	0.69	3.2		▨	▨	
61	61	7	Tc=5.35 A=3.30 Q=1.32					DMA 1.1,2 POST DETENTION	▨	▨	
61	72	3	443.0	410.0	95				▨	▨	
72	72	1						3 of 3	▨	▨	
72	64	3	410	377	95				▨	▨	
64	75	5	377	351	150	0.32	0.27		▨	▨	
75	75	11						Add Bank 2	▨	▨	
75	75	12						Clear Bank 2	▨		
									▨		
75	60	5	351	350	70	0.35	0.61		▨		
60	60	1						1 OF 2	▨		
									▨		
59	58	2	440	438.5	75	0.71	0.19		▨		
58	57	5	438.5	428	830	0.70	5		▨		
57	57	7	Tc=8.74 A=5.20 Q=0.94					DMA 3 POST DETENTION	▨		
57	56	3	428	378	170				▨		
56	60	5	373	350	108	0.35	*		▨		
60	60	1						2 OF 2	▨		
60	55	5	350	337	280	0.35	1.57		▨		
55	55	10						SAVE BANK 2	▨	▨	
									▨	▨	
55.9	55.9	7	Q= 49.1 Tc= 10 MINS A= 0					Incoming Q from offsite	▨	▨	
55.9	55.8	3	482	464	350				▨	▨	
55.8	55.8	1						1 OF 2	▨	▨	
									▨	▨	
54	53	2	561	542	75	0.35	0.07		▨	▨	
53	52	5	542	473	355	0.35	1.7		▨	▨	
52	55.8	3	467	464	45				▨	▨	
55.8	55.8	1						2 OF 2	▨	▨	
									▨	▨	
55.8	51	3	464	434	680				▨	▨	
51	51	10						SAVE BANK 3	▨	▨	▨

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Date: 8/09/16

Job #: 2780-002

Run Name:
P1-d.dat

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
50	49	2	606.4	604.5	40	0.9	0.08		▨	▨	▨
49	48	5	604.5	558.1	350	0.9	2.45		▨	▨	▨
48	47	3	552.1	546.2	195				▨	▨	▨
47	46	5	552.2	444	525	0.33	1.67		▨	▨	▨
46	46	1						1 OF 2	▨	▨	▨
									▨	▨	▨
45	44	2	606.4	603.5	93.5	0.9	0.16		▨	▨	▨
44	43	5	603.5	570.6	310	0.9	2.02		▨	▨	▨
43	42	3	564.6	559	95				▨	▨	▨
42	46	5	565	444	505	0.3	1.98		▨	▨	▨
46	46	1						2 OF 2	▨	▨	▨
									▨	▨	▨
46	51	3	438	434	50				▨	▨	▨
51	51	11						ADD BANK 3	▨	▨	▨
51	51	12						CLEAR BANK 3	▨	▨	
									▨	▨	
51	41	3	434	399	235				▨	▨	
41	37	5	399	385	115				▨	▨	
37	37	1						1 OF 2	▨	▨	
									▨	▨	
39	38	2	452	434	75	0.3	0.06		▨	▨	
38	37	5	434	385	215	0.3	1.08		▨	▨	
37	37	1						2 of 2	▨	▨	
									▨	▨	
37	55	5	385	336	420	0.3	2.40		▨	▨	
55	55	11						ADD BANK 2	▨	▨	
55	55	12						CLEAR BANK 2	▨		
									▨		
55	36	5	336	335	60	0.3	*		▨		
36	36	11						ADD BANK 1	▨		
36	36	12						CLEAR BANK 1			
36	35	5	335	314	760	0.34	7.93				
							49.53				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                            6390 Greenwich Drive
                                 Suite 200
                            San Diego, CA 92122

 ************************** DESCRIPTION OF STUDY **************************
* SWEETWATER VISTAS                                                        *
* PROPOSED HYDROLOGY WITH CISTERN DETENTION                                *
* RUN 1                                                                    *
 **************************************************************************

  FILE NAME: P1-D.DAT
  TIME/DATE OF STUDY: 14:56 08/15/2016
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================   ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     99.00 TO NODE     98.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    490.00
  DOWNSTREAM ELEVATION(FEET) =    488.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.123
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     98.00 TO NODE     97.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  488.00  DOWNSTREAM ELEVATION(FEET) =  464.00
  STREET LENGTH(FEET) =   430.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.98
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.18
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
  STREET FLOW TRAVEL TIME(MIN.) =   1.72   Tc(MIN.) =    3.84
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.831
  SUBAREA AREA(ACRES) =    0.46      SUBAREA RUNOFF(CFS) =    2.98
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       3.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.91
  FLOW VELOCITY(FEET/SEC.) =  4.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.33
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     97.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     97.00 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.) =    3.84
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.48

****************************************************************************
  FLOW PROCESS FROM NODE     96.00 TO NODE     95.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    489.00
  DOWNSTREAM ELEVATION(FEET) =    488.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.114
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE     95.00 TO NODE     97.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  488.50  DOWNSTREAM ELEVATION(FEET) =  464.00
```

```
  STREET LENGTH(FEET) =   435.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
  STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =    3.96
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.829
  SUBAREA AREA(ACRES) =    0.31      SUBAREA RUNOFF(CFS) =    2.01
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       2.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.45
  FLOW VELOCITY(FEET/SEC.) =  4.30   DEPTH*VELOCITY(FT*FT/SEC.) =   1.10
  LONGEST FLOWPATH FROM NODE     96.00 TO NODE     97.00 =     475.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     97.00 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.) =    3.96
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.29

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
```

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.48     3.84        7.904          0.53
      2        2.29     3.96        7.904          0.35

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.70     3.84       7.904
      2        5.77     3.96       7.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.77   Tc(MIN.) =    3.96
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     97.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     94.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   458.00  DOWNSTREAM(FEET) =   446.00
  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   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.72
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.77
  PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =    4.75
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     94.00 =     910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 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.) =    4.75
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

****************************************************************************
  FLOW PROCESS FROM NODE     93.00 TO NODE     92.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.878
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE     92.00 TO NODE     94.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  463.00  DOWNSTREAM ELEVATION(FEET) =  454.00
  STREET LENGTH(FEET) =   328.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.45
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.30
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   1.66   Tc(MIN.) =    5.54
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.402
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.56      SUBAREA RUNOFF(CFS) =    3.36
```

```
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       4.08

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.90
  FLOW VELOCITY(FEET/SEC.) =  3.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.20
  LONGEST FLOWPATH FROM NODE     93.00 TO NODE     94.00 =     398.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.54
  RAINFALL INTENSITY(INCH/HR) =   7.40
  TOTAL STREAM AREA(ACRES) =     0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.08

****************************************************************************
  FLOW PROCESS FROM NODE     91.00 TO NODE     90.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    463.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.968
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     94.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  463.00  DOWNSTREAM ELEVATION(FEET) =  454.00
```

```
  STREET LENGTH(FEET) =   328.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.85
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.77
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.62
  STREET FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    5.94
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.071
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.23      SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.45
  FLOW VELOCITY(FEET/SEC.) =  3.00   DEPTH*VELOCITY(FT*FT/SEC.) =   0.77
  LONGEST FLOWPATH FROM NODE     91.00 TO NODE     94.00 =    403.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     94.00 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.) =    5.94
  RAINFALL INTENSITY(INCH/HR) =   7.07
  TOTAL STREAM AREA(ACRES) =     0.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
    1        5.77     4.75        7.904          0.88
    2        4.08     5.54        7.402          0.68
    3        1.60     5.94        7.071          0.28

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1       10.55     4.75       7.904
    2       10.98     5.54       7.402
    3       10.66     5.94       7.071

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.98   Tc(MIN.) =    5.54
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     94.00 =     910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     94.00 TO NODE     89.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   448.00  DOWNSTREAM(FEET) =   415.00
  FLOW LENGTH(FEET) =   308.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.65
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.98
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    5.84
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     89.00 =    1218.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.84
  RAINFALL INTENSITY(INCH/HR) =   7.15
  TOTAL STREAM AREA(ACRES) =     1.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.98

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

```
  FLOW PROCESS FROM NODE     88.00 TO NODE     87.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    454.00
  DOWNSTREAM ELEVATION(FEET) =    451.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.848
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE     87.00 TO NODE     89.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  451.00  DOWNSTREAM ELEVATION(FEET) =  431.00
  STREET LENGTH(FEET) =   183.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.17
    HALFSTREET FLOOD WIDTH(FEET) =    2.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   0.54   Tc(MIN.) =    3.39
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    1.02
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.41

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   3.86
  FLOW VELOCITY(FEET/SEC.) =  5.28   DEPTH*VELOCITY(FT*FT/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE     88.00 TO NODE     89.00 =     258.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 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.) =    3.39
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.41

****************************************************************************
  FLOW PROCESS FROM NODE     86.00 TO NODE     85.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    41.00
  UPSTREAM ELEVATION(FEET) =    454.00
  DOWNSTREAM ELEVATION(FEET) =    451.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.722
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE     85.00 TO NODE     89.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  451.00  DOWNSTREAM ELEVATION(FEET) =  431.00
  STREET LENGTH(FEET) =   175.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00
```

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.38
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
  STREET FLOW TRAVEL TIME(MIN.) =   0.46   Tc(MIN.) =    2.18
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.77
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.17   HALFSTREET FLOOD WIDTH(FEET) =   2.33
  FLOW VELOCITY(FEET/SEC.) =  5.57   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE     86.00 TO NODE     89.00 =     216.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 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.) =    2.18
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.96

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       10.98     5.84        7.148          1.84
```

```
    2        1.41     3.39        7.904          0.22
    3        0.96     2.18        7.904          0.15

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        11.79     2.18       7.904
    2        12.30     3.39       7.904
    3        13.12     5.84       7.148

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.12   Tc(MIN.) =    5.84
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     89.00 =    1218.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     84.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   425.00  DOWNSTREAM(FEET) =   389.50
  FLOW LENGTH(FEET) =   435.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.78
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.12
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     84.00 =    1653.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 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.) =    6.30
  RAINFALL INTENSITY(INCH/HR) =   6.81
  TOTAL STREAM AREA(ACRES) =     2.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.12

****************************************************************************
  FLOW PROCESS FROM NODE     83.00 TO NODE     82.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    431.00
  DOWNSTREAM ELEVATION(FEET) =    423.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.098
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     84.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  423.00  DOWNSTREAM ELEVATION(FEET) =  384.00
  STREET LENGTH(FEET) =   520.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.05
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.21
  STREET FLOW TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =    3.87
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    4.10
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       4.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.24
  FLOW VELOCITY(FEET/SEC.) =  5.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.61
  LONGEST FLOWPATH FROM NODE     83.00 TO NODE     84.00 =     595.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 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.) =    3.87
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.42

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE     80.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
   *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    431.00
  DOWNSTREAM ELEVATION(FEET) =    423.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.027
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     84.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  423.00  DOWNSTREAM ELEVATION(FEET) =  390.00
  STREET LENGTH(FEET) =   565.00   CURB HEIGHT(INCHES) =  6.0
```

```
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.66
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
  STREET FLOW TRAVEL TIME(MIN.) =   2.27   Tc(MIN.) =    4.30
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.810
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    2.69
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       3.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.31
  FLOW VELOCITY(FEET/SEC.) =  4.61   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
  LONGEST FLOWPATH FROM NODE     81.00 TO NODE     84.00 =     635.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 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.) =    4.30
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     0.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.01

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
     1       13.12     6.30        6.807          2.21
     2        4.42     3.87        7.904          0.69
     3        3.01     4.30        7.904          0.47

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       18.43     3.87       7.904
     2       18.73     4.30       7.904
     3       19.52     6.30       6.807

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.52   Tc(MIN.) =    6.30
  TOTAL AREA(ACRES) =        3.4
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     84.00 =    1653.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     84.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   6.30   RAIN INTENSITY(INCH/HOUR) =  6.81
  TOTAL AREA(ACRES) =     3.40   TOTAL RUNOFF(CFS) =      1.04

****************************************************************************
  FLOW PROCESS FROM NODE     84.00 TO NODE     79.90 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   384.00  DOWNSTREAM(FEET) =   373.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.70
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.04
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    6.36
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     79.90 =    1693.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.90 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     79.80 TO NODE     79.70 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =    517.00
  DOWNSTREAM ELEVATION(FEET) =    486.00
  ELEVATION DIFFERENCE(FEET) =     31.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.341
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.781
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     79.70 TO NODE     79.60 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    486.00  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   555.00   CHANNEL SLOPE =  0.1369
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.027
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.47
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   3.74
  Tc(MIN.) =   10.09
  SUBAREA AREA(ACRES) =     0.43       SUBAREA RUNOFF(CFS) =    0.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.13
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.60 =     645.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.60 TO NODE     79.50 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   407.50  DOWNSTREAM(FEET) =   399.00
  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.) =   5.26
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.72
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =   10.80
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.50 =     870.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.50 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.) =   10.80
  RAINFALL INTENSITY(INCH/HR) =   4.81
  TOTAL STREAM AREA(ACRES) =     0.48
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE     79.40 TO NODE     79.30 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    443.00
  DOWNSTREAM ELEVATION(FEET) =    416.00
  ELEVATION DIFFERENCE(FEET) =     27.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.967
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     79.30 TO NODE     79.50 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    416.00  DOWNSTREAM(FEET) =    399.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   475.00   CHANNEL SLOPE =  0.0358
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.24
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.82
  AVERAGE FLOW DEPTH(FEET) =   0.48   TRAVEL TIME(MIN.) =   1.64
  Tc(MIN.) =    4.61
  SUBAREA AREA(ACRES) =     3.23       SUBAREA RUNOFF(CFS) =   17.62
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =      18.05

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.70   FLOW VELOCITY(FEET/SEC.) =   5.89
  LONGEST FLOWPATH FROM NODE     79.40 TO NODE     79.50 =     550.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.50 IS CODE =   7
------------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   5.00   RAIN INTENSITY(INCH/HOUR) =  7.90
  TOTAL AREA(ACRES) =     3.30   TOTAL RUNOFF(CFS) =      2.06

******************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.50 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.) =    5.00
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     3.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.06

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
```

```
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.72    10.80        4.810          0.48
      2        2.06     5.00        7.904          3.30

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.40     5.00       7.904
      2        1.98    10.80       4.810

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.40   Tc(MIN.) =    5.00
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.50 =     870.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.50 TO NODE     79.90 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   399.00  DOWNSTREAM(FEET) =   373.00
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.40
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    5.23
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.90 =    1040.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.90 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.40     5.23       7.677        3.78
  LONGEST FLOWPATH FROM NODE     79.80 TO NODE     79.90 =    1040.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.04     6.36       6.770        3.40
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     79.90 =    1693.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       3.25       5.23        7.677
      2       3.15       6.36        6.770

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.25   Tc(MIN.) =    5.23
  TOTAL AREA(ACRES) =        7.2

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.90 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     79.90 TO NODE     79.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   373.00  DOWNSTREAM(FEET) =   368.00
  FLOW LENGTH(FEET) =   175.00   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.) =   7.37
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.25
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    5.63
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     79.00 =    1868.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     79.00 TO NODE     36.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    368.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   183.00   CHANNEL SLOPE =  0.1803
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1502 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.25
  FLOW VELOCITY(FEET/SEC) =   3.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
```

```
  TRAVEL TIME(MIN.) =   0.95   Tc(MIN.) =    6.58
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     36.00 =    2051.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     73.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =    491.00
  DOWNSTREAM ELEVATION(FEET) =    483.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.243
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.666
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE     73.00 TO NODE     67.90 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    483.00  DOWNSTREAM(FEET) =    418.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1040.00   CHANNEL SLOPE =  0.0625
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.714
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.94
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   5.90
  Tc(MIN.) =   11.14
  SUBAREA AREA(ACRES) =     1.22       SUBAREA RUNOFF(CFS) =    2.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       2.15
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   3.58
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.90 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.90 TO NODE     67.90 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.) =   11.14
  RAINFALL INTENSITY(INCH/HR) =   4.71
  TOTAL STREAM AREA(ACRES) =     1.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.15

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     62.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    464.00
  DOWNSTREAM ELEVATION(FEET) =    458.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.372
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     67.80 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    458.00  DOWNSTREAM(FEET) =    453.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   355.00   CHANNEL SLOPE =  0.0141
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.537
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.94
  AVERAGE FLOW DEPTH(FEET) =   0.46   TRAVEL TIME(MIN.) =   2.01
  Tc(MIN.) =    5.38
  SUBAREA AREA(ACRES) =     1.87       SUBAREA RUNOFF(CFS) =    9.73
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  TOTAL AREA(ACRES) =        2.0         PEAK FLOW RATE(CFS) =      10.14

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.65   FLOW VELOCITY(FEET/SEC.) =   3.60
  LONGEST FLOWPATH FROM NODE     63.00 TO NODE     67.80 =     435.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.80 TO NODE     67.80 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   5.38   RAIN INTENSITY(INCH/HOUR) =  7.54
  TOTAL AREA(ACRES) =     2.00   TOTAL RUNOFF(CFS) =      1.73

****************************************************************************
  FLOW PROCESS FROM NODE     67.80 TO NODE     67.90 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   452.00  DOWNSTREAM(FEET) =   421.00
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.45
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.73
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    5.65
  LONGEST FLOWPATH FROM NODE     63.00 TO NODE     67.90 =     620.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.90 TO NODE     67.90 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.) =    5.65
  RAINFALL INTENSITY(INCH/HR) =   7.31
```

```
  TOTAL STREAM AREA(ACRES) =     2.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.73

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.15    11.14        4.714          1.30
      2        1.73     5.65        7.306          2.00

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.82     5.65       7.306
      2        3.26    11.14       4.714

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.26   Tc(MIN.) =   11.14
  TOTAL AREA(ACRES) =        3.3
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.90 =    1110.00 FEET.

*****************************************************************************
  FLOW PROCESS FROM NODE     67.90 TO NODE     67.00 IS CODE =  53
-----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
=============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    421.00  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   105.00   CHANNEL SLOPE =  0.3333
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2023 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.26
  FLOW VELOCITY(FEET/SEC) =   3.73 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.47   Tc(MIN.) =   11.61
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.00 =    1215.00 FEET.

*****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     67.00 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.) =   11.61
  RAINFALL INTENSITY(INCH/HR) =   4.59
  TOTAL STREAM AREA(ACRES) =     3.30
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.26

****************************************************************************
  FLOW PROCESS FROM NODE     78.00 TO NODE     77.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    443.80
  DOWNSTREAM ELEVATION(FEET) =    443.20
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.594
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE     77.00 TO NODE     76.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  443.20  DOWNSTREAM ELEVATION(FEET) =  440.00
  STREET LENGTH(FEET) =   440.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.72
  STREET FLOW TRAVEL TIME(MIN.) =   3.57   Tc(MIN.) =    6.16
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.905
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    0.63      SUBAREA RUNOFF(CFS) =    3.92
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.79
  FLOW VELOCITY(FEET/SEC.) =  2.31   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE     78.00 TO NODE     76.00 =     495.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     67.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    440.00  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   370.00   CHANNEL SLOPE =  0.1459
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.325
   *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.86
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   0.90
  Tc(MIN.) =    7.06
  SUBAREA AREA(ACRES) =     1.36       SUBAREA RUNOFF(CFS) =    3.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.545
  TOTAL AREA(ACRES) =        2.1         PEAK FLOW RATE(CFS) =       7.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   7.15
  LONGEST FLOWPATH FROM NODE     78.00 TO NODE     67.00 =     865.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     67.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.06
  RAINFALL INTENSITY(INCH/HR) =   6.32
  TOTAL STREAM AREA(ACRES) =     2.11
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.28
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     67.50 TO NODE     67.50 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  15.00   RAIN INTENSITY(INCH/HOUR) =  3.89
  TOTAL AREA(ACRES) =     0.00   TOTAL RUNOFF(CFS) =    500.00

****************************************************************************
  FLOW PROCESS FROM NODE     67.50 TO NODE     67.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    415.00  DOWNSTREAM(FEET) =    386.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   190.00   CHANNEL SLOPE =  0.1526
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1363 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =     500.00
  FLOW VELOCITY(FEET/SEC) =  16.38 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.19   Tc(MIN.) =   15.19
  LONGEST FLOWPATH FROM NODE     81.00 TO NODE     67.00 =     825.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     67.00 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.) =   15.19
  RAINFALL INTENSITY(INCH/HR) =   3.86
  TOTAL STREAM AREA(ACRES) =     0.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    500.00

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         3.26    11.61        4.591          3.30
     2         7.28     7.06        6.325          2.11
     3       500.00    15.19        3.859          0.00

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

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      242.12     7.06       6.325
      2      390.61    11.61       4.591
      3      507.18    15.19       3.859

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     507.18   Tc(MIN.) =   15.19
  TOTAL AREA(ACRES) =        5.4
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     67.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     75.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    392.00  DOWNSTREAM(FEET) =    351.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   695.00   CHANNEL SLOPE =  0.0590
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.753
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     509.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  17.28
  AVERAGE FLOW DEPTH(FEET) =   3.16   TRAVEL TIME(MIN.) =   0.67
  Tc(MIN.) =   15.86
  SUBAREA AREA(ACRES) =     3.97       SUBAREA RUNOFF(CFS) =    5.22
  AREA-AVERAGE RUNOFF COEFFICIENT = 14.041
  TOTAL AREA(ACRES) =        9.4         PEAK FLOW RATE(CFS) =     507.18

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.16   FLOW VELOCITY(FEET/SEC.) =  17.26
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     75.00 =    1910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     68.00 TO NODE     66.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   118.00
  UPSTREAM ELEVATION(FEET) =    449.00
  DOWNSTREAM ELEVATION(FEET) =    411.00
  ELEVATION DIFFERENCE(FEET) =     38.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.684
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.554
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE     66.00 TO NODE     72.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    411.00  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   217.00   CHANNEL SLOPE =  0.0046
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.693
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.80
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   4.53
  Tc(MIN.) =   11.22
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE     68.00 TO NODE     72.00 =     335.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 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.) =   11.22
  RAINFALL INTENSITY(INCH/HR) =   4.69
  TOTAL STREAM AREA(ACRES) =     0.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.48

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     70.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    82.00
  UPSTREAM ELEVATION(FEET) =    450.00
  DOWNSTREAM ELEVATION(FEET) =    411.00
  ELEVATION DIFFERENCE(FEET) =     39.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.053
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.988
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     72.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    411.00  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   124.00   CHANNEL SLOPE =  0.0081
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.604
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.84
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   2.47
  Tc(MIN.) =    8.52
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.30

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE     71.00 TO NODE     72.00 =     206.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 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.) =    8.52
  RAINFALL INTENSITY(INCH/HR) =   5.60
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE     72.90 TO NODE     72.80 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    460.00
  DOWNSTREAM ELEVATION(FEET) =    456.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.860
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     72.80 TO NODE     61.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    456.00  DOWNSTREAM(FEET) =    448.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   360.00   CHANNEL SLOPE =  0.0222
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.567
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.82
```

```
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.03
  AVERAGE FLOW DEPTH(FEET) =   0.54   TRAVEL TIME(MIN.) =   1.49
  Tc(MIN.) =    5.35
  SUBAREA AREA(ACRES) =     3.20       SUBAREA RUNOFF(CFS) =   16.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.690
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =      17.13

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.77   FLOW VELOCITY(FEET/SEC.) =   4.92
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     61.00 =     440.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     61.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   5.35   RAIN INTENSITY(INCH/HOUR) =  7.57
  TOTAL AREA(ACRES) =     3.30   TOTAL RUNOFF(CFS) =      1.32

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     72.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   443.00  DOWNSTREAM(FEET) =   410.00
  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   1.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.61
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.32
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    5.47
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     72.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 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.) =    5.47
  RAINFALL INTENSITY(INCH/HR) =   7.46
  TOTAL STREAM AREA(ACRES) =     3.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.32
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.48    11.22        4.693          0.34
      2        0.30     8.52        5.604          0.18
      3        1.32     5.47        7.462          3.30

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.75     5.47       7.462
      2        1.66     8.52       5.604
      3        1.56    11.22       4.693

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.75   Tc(MIN.) =    5.47
  TOTAL AREA(ACRES) =        3.8
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     72.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     72.00 TO NODE     64.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   410.00  DOWNSTREAM(FEET) =   377.00
  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   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.83
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.75
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    5.57
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     64.00 =     630.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     75.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    377.00  DOWNSTREAM(FEET) =    351.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00   CHANNEL SLOPE =  0.1733
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
```

```
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.970
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.96
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.50
  Tc(MIN.) =    6.08
  SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =    0.60
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.102
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       2.91

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   5.57
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     75.00 =     780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        2.91     6.08       6.970        4.09
  LONGEST FLOWPATH FROM NODE     72.90 TO NODE     75.00 =     780.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      507.18    15.86       3.753        9.38
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     75.00 =    1910.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     197.19       6.08        6.970
     2     508.75      15.86        3.753

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     508.75   Tc(MIN.) =   15.86
  TOTAL AREA(ACRES) =       13.5

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     60.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    351.00  DOWNSTREAM(FEET) =    350.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0143
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.736
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     509.15
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.15
  AVERAGE FLOW DEPTH(FEET) =   4.31   TRAVEL TIME(MIN.) =   0.11
  Tc(MIN.) =   15.98
  SUBAREA AREA(ACRES) =     0.61       SUBAREA RUNOFF(CFS) =    0.80
  AREA-AVERAGE RUNOFF COEFFICIENT =  9.399
  TOTAL AREA(ACRES) =       14.1         PEAK FLOW RATE(CFS) =     508.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  4.31   FLOW VELOCITY(FEET/SEC.) =  10.17
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     60.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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.) =   15.98
  RAINFALL INTENSITY(INCH/HR) =   3.74
  TOTAL STREAM AREA(ACRES) =    14.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    508.75

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     58.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7100
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    440.00
  DOWNSTREAM ELEVATION(FEET) =    438.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.825
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.07
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      1.07

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     57.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    438.50  DOWNSTREAM(FEET) =    428.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   830.00   CHANNEL SLOPE =  0.0127
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.511
   *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.53
  AVERAGE FLOW DEPTH(FEET) =   0.70   TRAVEL TIME(MIN.) =   3.92
  Tc(MIN.) =    8.74
  SUBAREA AREA(ACRES) =     5.00       SUBAREA RUNOFF(CFS) =   19.29
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.700
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      20.03

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.97   FLOW VELOCITY(FEET/SEC.) =   4.20
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     57.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     57.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   8.74   RAIN INTENSITY(INCH/HOUR) =  5.51
  TOTAL AREA(ACRES) =     5.20   TOTAL RUNOFF(CFS) =      0.94

****************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     56.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   428.00  DOWNSTREAM(FEET) =   378.00
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.64
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.94
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    8.98
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     56.00 =    1075.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     56.00 TO NODE     60.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    373.00  DOWNSTREAM(FEET) =    350.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   108.00   CHANNEL SLOPE =  0.2130
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1665 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.94
  FLOW VELOCITY(FEET/SEC) =   2.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.79   Tc(MIN.) =    9.77
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     60.00 =    1183.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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.) =    9.77
  RAINFALL INTENSITY(INCH/HR) =   5.13
  TOTAL STREAM AREA(ACRES) =     5.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.94

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      508.75    15.98        3.736         14.08
      2        0.94     9.77        5.131          5.20
```

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      312.05     9.77       5.131
      2      509.43    15.98       3.736

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     509.43   Tc(MIN.) =   15.98
  TOTAL AREA(ACRES) =       19.3
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     60.00 =    1980.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     55.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    350.00  DOWNSTREAM(FEET) =    337.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   280.00   CHANNEL SLOPE =  0.0464
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.692
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     510.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  15.80
  AVERAGE FLOW DEPTH(FEET) =   3.34   TRAVEL TIME(MIN.) =   0.30
  Tc(MIN.) =   16.27
  SUBAREA AREA(ACRES) =     1.57       SUBAREA RUNOFF(CFS) =    2.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  6.382
  TOTAL AREA(ACRES) =       20.9         PEAK FLOW RATE(CFS) =     509.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.34   FLOW VELOCITY(FEET/SEC.) =  15.78
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    2260.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

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

```
  FLOW PROCESS FROM NODE     55.90 TO NODE     55.90 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  10.00   RAIN INTENSITY(INCH/HOUR) =  5.05
  TOTAL AREA(ACRES) =     0.00   TOTAL RUNOFF(CFS) =     49.10

****************************************************************************
  FLOW PROCESS FROM NODE     55.90 TO NODE     55.80 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   482.00  DOWNSTREAM(FEET) =   464.00
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.33
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      49.10
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =   10.32
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.80 =    2610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.80 TO NODE     55.80 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.) =   10.32
  RAINFALL INTENSITY(INCH/HR) =   4.95
  TOTAL STREAM AREA(ACRES) =     0.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     49.10

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     53.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    561.00
  DOWNSTREAM ELEVATION(FEET) =    542.00
  ELEVATION DIFFERENCE(FEET) =     19.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.427
```

```
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.497
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     52.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    542.00  DOWNSTREAM(FEET) =    473.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   355.00   CHANNEL SLOPE =  0.1944
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.686
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.61
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.05
  Tc(MIN.) =    6.48
  SUBAREA AREA(ACRES) =     1.70       SUBAREA RUNOFF(CFS) =    3.98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       4.14

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   6.84
  LONGEST FLOWPATH FROM NODE     54.00 TO NODE     52.00 =     430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     55.80 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) =   464.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.14
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    6.55
  LONGEST FLOWPATH FROM NODE     54.00 TO NODE     55.80 =     475.00 FEET.

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

```
  FLOW PROCESS FROM NODE     55.80 TO NODE     55.80 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.) =    6.55
  RAINFALL INTENSITY(INCH/HR) =   6.64
  TOTAL STREAM AREA(ACRES) =     1.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.14

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       49.10    10.32        4.954          0.00
     2        4.14     6.55        6.639          1.77

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       35.32     6.55       6.639
     2       52.19    10.32       4.954

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      52.19   Tc(MIN.) =   10.32
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.80 =    2610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.80 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   464.00  DOWNSTREAM(FEET) =   434.00
  FLOW LENGTH(FEET) =   680.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.41
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      52.19
  PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   10.97
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     51.00 =    3290.00 FEET.

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

```
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     49.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    606.40
  DOWNSTREAM ELEVATION(FEET) =    604.50
  ELEVATION DIFFERENCE(FEET) =      1.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.355
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE     49.00 TO NODE     48.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    604.50  DOWNSTREAM(FEET) =    558.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.1326
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.61
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    2.12
  SUBAREA AREA(ACRES) =     2.45       SUBAREA RUNOFF(CFS) =   17.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =      18.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   9.34
```

```
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     48.00 =     390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     48.00 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) =   552.10  DOWNSTREAM(FEET) =   546.20
  FLOW LENGTH(FEET) =   195.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.72
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.00
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    2.40
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     47.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     46.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    552.20  DOWNSTREAM(FEET) =    444.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   525.00   CHANNEL SLOPE =  0.2061
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.34
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   0.77
  Tc(MIN.) =    3.17
  SUBAREA AREA(ACRES) =     1.67       SUBAREA RUNOFF(CFS) =    4.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.673
  TOTAL AREA(ACRES) =        4.2         PEAK FLOW RATE(CFS) =      22.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =  11.65
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     46.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =    3.17
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     4.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.35

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     44.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    93.50
  UPSTREAM ELEVATION(FEET) =    606.40
  DOWNSTREAM ELEVATION(FEET) =    603.50
  ELEVATION DIFFERENCE(FEET) =      2.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.387
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.14
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      1.14

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     43.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    603.50  DOWNSTREAM(FEET) =    570.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   310.00   CHANNEL SLOPE =  0.1061
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.82
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   0.76
  Tc(MIN.) =    3.14
  SUBAREA AREA(ACRES) =     2.02       SUBAREA RUNOFF(CFS) =   14.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =      15.51
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =   8.25
  LONGEST FLOWPATH FROM NODE     45.00 TO NODE     43.00 =     403.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   564.60  DOWNSTREAM(FEET) =   559.00
  FLOW LENGTH(FEET) =    95.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.53
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      15.51
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    3.25
  LONGEST FLOWPATH FROM NODE     45.00 TO NODE     42.00 =     498.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     46.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    565.00  DOWNSTREAM(FEET) =    444.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   505.00   CHANNEL SLOPE =  0.2396
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.43
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   0.74
  Tc(MIN.) =    3.99
  SUBAREA AREA(ACRES) =     1.98       SUBAREA RUNOFF(CFS) =    4.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.614
  TOTAL AREA(ACRES) =        4.2         PEAK FLOW RATE(CFS) =      20.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.44   FLOW VELOCITY(FEET/SEC.) =  11.85
  LONGEST FLOWPATH FROM NODE     45.00 TO NODE     46.00 =    1003.50 FEET.

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

```
  FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =    3.99
  RAINFALL INTENSITY(INCH/HR) =   7.90
  TOTAL STREAM AREA(ACRES) =     4.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.20

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       22.35     3.17        7.904          4.20
      2       20.20     3.99        7.904          4.16

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       38.40     3.17       7.904
      2       42.56     3.99       7.904

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      42.56   Tc(MIN.) =    3.99
  TOTAL AREA(ACRES) =        8.4
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     46.00 =    1110.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     46.00 TO NODE     51.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.00  DOWNSTREAM(FEET) =   434.00
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.91
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      42.56
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.03
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     51.00 =    1160.00 FEET.

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

```
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       42.56     4.03       7.904        8.36
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     51.00 =    1160.00 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       52.19    10.97       4.762        1.77
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     51.00 =    3290.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      61.73       4.03        7.904
     2      77.83      10.97        4.762

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      77.83   Tc(MIN.) =   10.97
  TOTAL AREA(ACRES) =       10.1

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     51.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 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) =   434.00  DOWNSTREAM(FEET) =   399.00
  FLOW LENGTH(FEET) =   235.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  29.97
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      77.83
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   11.10
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     41.00 =    3525.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     37.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    399.00  DOWNSTREAM(FEET) =    385.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.1217
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1162 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      77.83
  FLOW VELOCITY(FEET/SEC) =   8.14 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.24   Tc(MIN.) =   11.34
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     37.00 =    3640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =   11.34
  RAINFALL INTENSITY(INCH/HR) =   4.66
  TOTAL STREAM AREA(ACRES) =    10.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     77.83

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     38.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    452.00
  DOWNSTREAM ELEVATION(FEET) =    434.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.789
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.192
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     37.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    434.00  DOWNSTREAM(FEET) =    385.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.2279
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.602
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.37
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   0.82
  Tc(MIN.) =    6.61
  SUBAREA AREA(ACRES) =     1.08       SUBAREA RUNOFF(CFS) =    2.14
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       2.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.56
  LONGEST FLOWPATH FROM NODE     39.00 TO NODE     37.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =    6.61
  RAINFALL INTENSITY(INCH/HR) =   6.60
  TOTAL STREAM AREA(ACRES) =     1.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.26

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       77.83    11.34        4.662         10.13
      2        2.26     6.61        6.602          1.14

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
```

```
    1       47.63     6.61       6.602
    2       79.42    11.34       4.662

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      79.42   Tc(MIN.) =   11.34
  TOTAL AREA(ACRES) =       11.3
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     37.00 =    3640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     55.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    385.00  DOWNSTREAM(FEET) =    336.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   420.00   CHANNEL SLOPE =  0.1167
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.532
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      81.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.73
  AVERAGE FLOW DEPTH(FEET) =   1.12   TRAVEL TIME(MIN.) =   0.51
  Tc(MIN.) =   11.85
  SUBAREA AREA(ACRES) =     2.40       SUBAREA RUNOFF(CFS) =    3.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  1.227
  TOTAL AREA(ACRES) =       13.7         PEAK FLOW RATE(CFS) =      79.42

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.11   FLOW VELOCITY(FEET/SEC.) =  13.69
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    4060.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       79.42    11.85       4.532       13.67
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    4060.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      509.43    16.27       3.692       20.85
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     55.00 =    2260.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     450.22      11.85        4.532
      2     574.14      16.27        3.692

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     574.14   Tc(MIN.) =   16.27
  TOTAL AREA(ACRES) =       34.5

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     55.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     36.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    336.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    60.00   CHANNEL SLOPE =  0.0167
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0167 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =     574.14
  FLOW VELOCITY(FEET/SEC) =   6.00 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.17   Tc(MIN.) =   16.44
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     36.00 =    4120.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      574.14    16.44       3.668       34.52
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     36.00 =    4120.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
```

```
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.25     6.58       6.623        7.18
  LONGEST FLOWPATH FROM NODE     99.00 TO NODE     36.00 =    2051.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     232.92       6.58        6.623
      2     575.94      16.44        3.668

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     575.94   Tc(MIN.) =   16.44
  TOTAL AREA(ACRES) =       41.7

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    335.00  DOWNSTREAM(FEET) =    314.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   760.00   CHANNEL SLOPE =  0.0276
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.538
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     580.72
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.45
  AVERAGE FLOW DEPTH(FEET) =   3.96   TRAVEL TIME(MIN.) =   0.94
  Tc(MIN.) =   17.38
  SUBAREA AREA(ACRES) =     7.93       SUBAREA RUNOFF(CFS) =    9.54
  AREA-AVERAGE RUNOFF COEFFICIENT =  3.085
  TOTAL AREA(ACRES) =       49.6         PEAK FLOW RATE(CFS) =     575.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  3.94   FLOW VELOCITY(FEET/SEC.) =  13.43
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     35.00 =    4880.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
```

```
  TOTAL AREA(ACRES)     =       49.6  TC(MIN.) =     17.38
  PEAK FLOW RATE(CFS)   =     575.94
=============================================================================
=============================================================================
  END OF RATIONAL METHOD ANALYSIS

🡅
```

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Job Name: Sweetwater Vistas

Date: 7/14/15

Job #: 2780-002

Run Name:
P2.DAT

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (ac.)	Comments	BANK		
									1	2	3
30	29	2	391	390	85	0.9	0.07				
29	28	6	390	313	890	0.9	1.15	1 SIDE OF STREET			
28	28	10						SAVE BANK 1	▨		
									▨		
27	26	2	440.6	440	56.18	0.9	0.09		▨		
26	25	6	440	363	1755	0.9	1.95	1 SIDE OF STREET	▨		
25	25	1						1 OF 2	▨		
									▨		
24	23	2	428	424	100	0.3	0.07		▨		
23	25	5	424	362	1180	0.3	2.14		▨		
25	25	1						2 OF 2	▨		
									▨		
25	28	6	362	313	795	0.9	2.34		▨		
28	28	11						ADD BANK 1	▨		
28	28	12						CLEAR BANK 1			
28	22	6	313	296	375	0.9	1.00				
							8.81				

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                      6390 Greenwich Drive, Suite 170
                               San Diego, CA
                                   92122

 ************************** DESCRIPTION OF STUDY **************************
* SWEETWATER VISTAS                                                         *
* PROPOSED HYDROLOGY                                                        *
* RUN 2                                                                     *
 **************************************************************************

  FILE NAME: P2.DAT
  TIME/DATE OF STUDY: 07:43 08/10/2016
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================   ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     29.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    391.00
  DOWNSTREAM ELEVATION(FEET) =    390.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.117
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    52.65
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     29.00 TO NODE     28.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  390.50  DOWNSTREAM ELEVATION(FEET) =  313.00
  STREET LENGTH(FEET) =   890.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.85
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.66
```

```
  STREET FLOW TRAVEL TIME(MIN.) =   2.54   Tc(MIN.) =    5.65
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.303
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    7.56
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       8.02

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.35
  FLOW VELOCITY(FEET/SEC.) =  6.74   DEPTH*VELOCITY(FT*FT/SEC.) =   2.25
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     28.00 =     975.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     26.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    56.18
  UPSTREAM ELEVATION(FEET) =    440.60
  DOWNSTREAM ELEVATION(FEET) =    440.00
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.640
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.904
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.64
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.64

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     25.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  440.00  DOWNSTREAM ELEVATION(FEET) =  363.00
  STREET LENGTH(FEET) =  1755.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00
```

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.62
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.79
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.59
  STREET FLOW TRAVEL TIME(MIN.) =   6.11   Tc(MIN.) =    8.75
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.509
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  SUBAREA AREA(ACRES) =    1.95      SUBAREA RUNOFF(CFS) =    9.67
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =      10.12

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.16
  FLOW VELOCITY(FEET/SEC.) =  5.46   DEPTH*VELOCITY(FT*FT/SEC.) =   2.13
  LONGEST FLOWPATH FROM NODE     27.00 TO NODE     25.00 =    1811.18 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.75
  RAINFALL INTENSITY(INCH/HR) =   5.51
  TOTAL STREAM AREA(ACRES) =     2.04
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.12

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     23.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    428.00
  DOWNSTREAM ELEVATION(FEET) =    424.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.958
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    97.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.427
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     25.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    424.00  DOWNSTREAM(FEET) =    362.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1180.00   CHANNEL SLOPE =  0.0525
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.780
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.36
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.92
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   6.73
  Tc(MIN.) =   15.69
  SUBAREA AREA(ACRES) =     2.14       SUBAREA RUNOFF(CFS) =    2.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =       2.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   3.62
  LONGEST FLOWPATH FROM NODE     24.00 TO NODE     25.00 =    1280.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =   15.69
  RAINFALL INTENSITY(INCH/HR) =   3.78
  TOTAL STREAM AREA(ACRES) =     2.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.51

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.12     8.75        5.509          2.04
      2        2.51    15.69        3.780          2.21

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       11.51     8.75       5.509
      2        9.45    15.69       3.780

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.51   Tc(MIN.) =    8.75
  TOTAL AREA(ACRES) =        4.2
  LONGEST FLOWPATH FROM NODE     27.00 TO NODE     25.00 =    1811.18 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     28.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  362.00  DOWNSTREAM ELEVATION(FEET) =  313.00
  STREET LENGTH(FEET) =   795.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.61
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.43
    HALFSTREET FLOOD WIDTH(FEET) =   14.96
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.00
  STREET FLOW TRAVEL TIME(MIN.) =   1.88   Tc(MIN.) =   10.63
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.859
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.699
  SUBAREA AREA(ACRES) =    2.34      SUBAREA RUNOFF(CFS) =   10.23
  TOTAL AREA(ACRES) =        6.6        PEAK FLOW RATE(CFS) =      22.38

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  16.84
  FLOW VELOCITY(FEET/SEC.) =  7.58   DEPTH*VELOCITY(FT*FT/SEC.) =   3.51
  LONGEST FLOWPATH FROM NODE     27.00 TO NODE     28.00 =    2606.18 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       22.38    10.63       4.859        6.59
  LONGEST FLOWPATH FROM NODE     27.00 TO NODE     28.00 =    2606.18 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        8.02     5.65       7.303        1.22
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     28.00 =     975.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.92       5.65        7.303
      2      27.71      10.63        4.859

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      27.71   Tc(MIN.) =   10.63
  TOTAL AREA(ACRES) =        7.8

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
```

```
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  313.00  DOWNSTREAM ELEVATION(FEET) =  296.00
  STREET LENGTH(FEET) =   375.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      29.79
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.53
    HALFSTREET FLOOD WIDTH(FEET) =   21.39
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.18
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.78
  STREET FLOW TRAVEL TIME(MIN.) =   0.87   Tc(MIN.) =   11.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.619
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.749
  SUBAREA AREA(ACRES) =    1.00      SUBAREA RUNOFF(CFS) =    4.16
  TOTAL AREA(ACRES) =        8.8        PEAK FLOW RATE(CFS) =      30.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.53   HALFSTREET FLOOD WIDTH(FEET) =  21.70
  FLOW VELOCITY(FEET/SEC.) =  7.23   DEPTH*VELOCITY(FT*FT/SEC.) =   3.83
  LONGEST FLOWPATH FROM NODE     27.00 TO NODE     22.00 =    2981.18 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.8  TC(MIN.) =     11.50
  PEAK FLOW RATE(CFS)   =      30.50
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

⬆

APPENDIX 5: CISTERN DETENTION ANALYSIS

10 YEAR

DMA 1.1-1.2

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RUN DATE   8/12/2016
TIME OF CONCENTRATION  6  MIN.
6 HOUR RAINFALL  1.9  INCHES
BASIN AREA  3.28  ACRES
RUNOFF COEFFICIENT  0.69
PEAK DISCHARGE  10.55  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  6  DISCHARGE (CFS) =  0.3
TIME (MIN) =  12  DISCHARGE (CFS) =  0.3
TIME (MIN) =  18  DISCHARGE (CFS) =  0.3
TIME (MIN) =  24  DISCHARGE (CFS) =  0.3
TIME (MIN) =  30  DISCHARGE (CFS) =  0.3
TIME (MIN) =  36  DISCHARGE (CFS) =  0.3
TIME (MIN) =  42  DISCHARGE (CFS) =  0.3
TIME (MIN) =  48  DISCHARGE (CFS) =  0.3
TIME (MIN) =  54  DISCHARGE (CFS) =  0.3
TIME (MIN) =  60  DISCHARGE (CFS) =  0.3
TIME (MIN) =  66  DISCHARGE (CFS) =  0.3
TIME (MIN) =  72  DISCHARGE (CFS) =  0.3
TIME (MIN) =  78  DISCHARGE (CFS) =  0.3
TIME (MIN) =  84  DISCHARGE (CFS) =  0.3
TIME (MIN) =  90  DISCHARGE (CFS) =  0.3
TIME (MIN) =  96  DISCHARGE (CFS) =  0.3
```

TIME (MIN) = 102 DISCHARGE (CFS) = 0.4

TIME (MIN) = 108 DISCHARGE (CFS) = 0.4

TIME (MIN) = 114 DISCHARGE (CFS) = 0.4

TIME (MIN) = 120 DISCHARGE (CFS) = 0.4

TIME (MIN) = 126 DISCHARGE (CFS) = 0.4

TIME (MIN) = 132 DISCHARGE (CFS) = 0.4

TIME (MIN) = 138 DISCHARGE (CFS) = 0.4

TIME (MIN) = 144 DISCHARGE (CFS) = 0.4

TIME (MIN) = 150 DISCHARGE (CFS) = 0.5

TIME (MIN) = 156 DISCHARGE (CFS) = 0.5

TIME (MIN) = 162 DISCHARGE (CFS) = 0.5

TIME (MIN) = 168 DISCHARGE (CFS) = 0.5

TIME (MIN) = 174 DISCHARGE (CFS) = 0.6

TIME (MIN) = 180 DISCHARGE (CFS) = 0.6

TIME (MIN) = 186 DISCHARGE (CFS) = 0.6

TIME (MIN) = 192 DISCHARGE (CFS) = 0.7

TIME (MIN) = 198 DISCHARGE (CFS) = 0.7

TIME (MIN) = 204 DISCHARGE (CFS) = 0.8

TIME (MIN) = 210 DISCHARGE (CFS) = 0.9

TIME (MIN) = 216 DISCHARGE (CFS) = 1

TIME (MIN) = 222 DISCHARGE (CFS) = 1.2

TIME (MIN) = 228 DISCHARGE (CFS) = 1.4

TIME (MIN) = 234 DISCHARGE (CFS) = 2

TIME (MIN) = 240 DISCHARGE (CFS) = 2.3

TIME (MIN) = 246 DISCHARGE (CFS) = 10.55

TIME (MIN) = 252 DISCHARGE (CFS) = 1.6

TIME (MIN) = 258 DISCHARGE (CFS) = 1.1

TIME (MIN) = 264 DISCHARGE (CFS) = 0.8

TIME (MIN) = 270 DISCHARGE (CFS) = 0.7

TIME (MIN) = 276 DISCHARGE (CFS) = 0.6

TIME (MIN) = 282 DISCHARGE (CFS) = 0.5

TIME (MIN) = 288 DISCHARGE (CFS) = 0.5

TIME (MIN) = 294 DISCHARGE (CFS) = 0.5

TIME (MIN) = 300 DISCHARGE (CFS) = 0.4

TIME (MIN) = 306 DISCHARGE (CFS) = 0.4

TIME (MIN) = 312 DISCHARGE (CFS) = 0.4

TIME (MIN) = 318 DISCHARGE (CFS) = 0.4

TIME (MIN) = 324 DISCHARGE (CFS) = 0.3

TIME (MIN) = 330 DISCHARGE (CFS) = 0.3

TIME (MIN) = 336 DISCHARGE (CFS) = 0.3

TIME (MIN) = 342 DISCHARGE (CFS) = 0.3

TIME (MIN) = 348 DISCHARGE (CFS) = 0.3

TIME (MIN) = 354 DISCHARGE (CFS) = 0.3

TIME (MIN) = 360 DISCHARGE (CFS) = 0.3

TIME (MIN) = 366 DISCHARGE (CFS) = 0

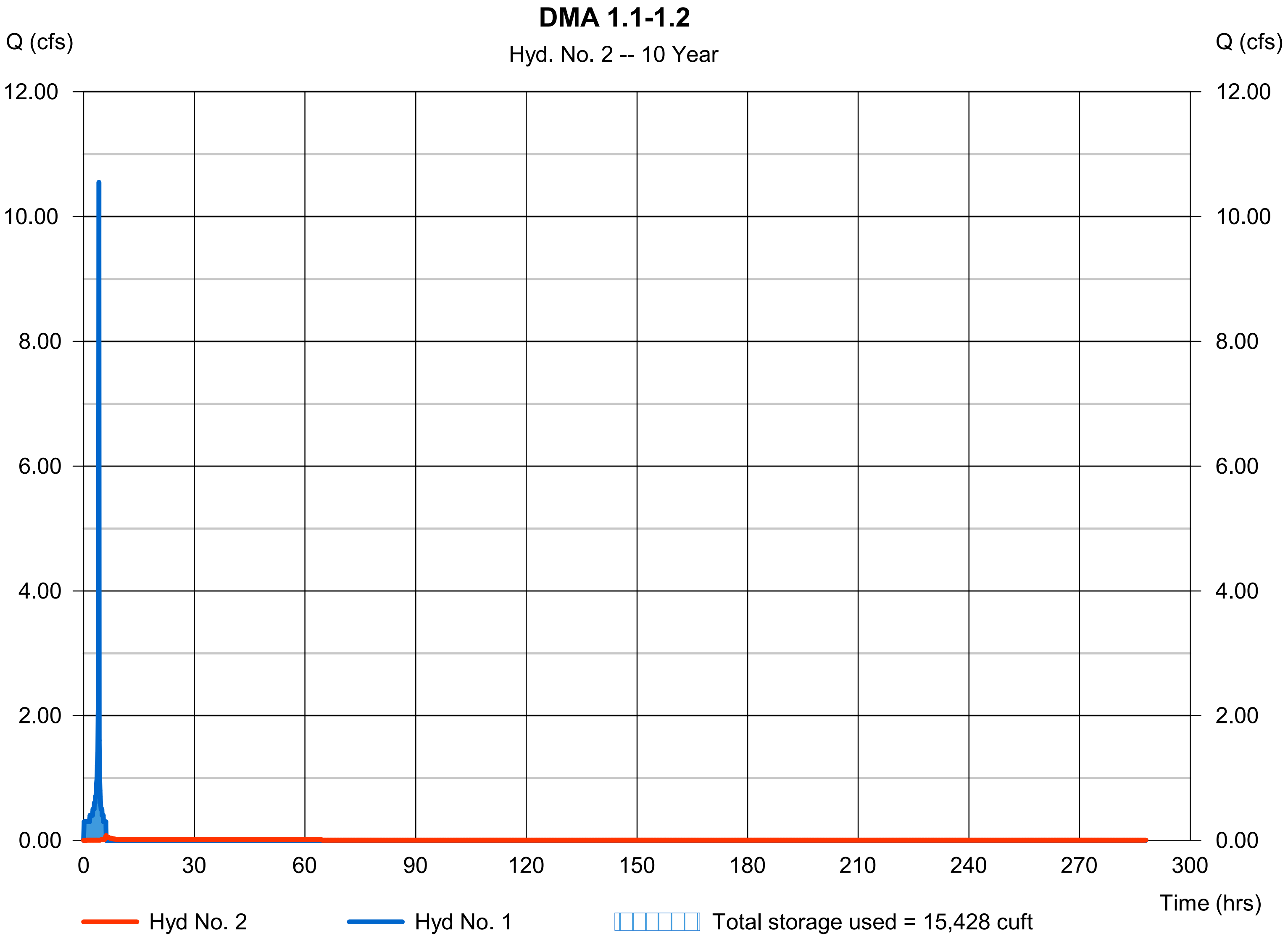
Hydrograph Report

Hyd. No. 2

DMA 1.1-1.2

Hydrograph type	= Reservoir	Peak discharge	= 0.080 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.10 hrs
Time interval	= 6 min	Hyd. volume	= 7,366 cuft
Inflow hyd. No.	= 1 - DMA 1.1-1.2	Max. Elevation	= 445.13 ft
Reservoir name	= DMA 1.1-1.2	Max. Storage	= 15,428 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DMA 1.1-1.2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 440.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	440.00	00	0	0
1.00	441.00	3,645	1,154	1,154
2.00	442.00	3,645	3,462	4,617
3.00	443.00	3,645	3,462	8,079
4.00	444.00	3,645	3,462	11,541
5.00	445.00	3,645	3,462	15,004
6.00	446.00	3,645	3,462	18,466

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.70	12.00	0.00	0.00
Span (in)	= 0.70	12.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 440.00	445.00	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

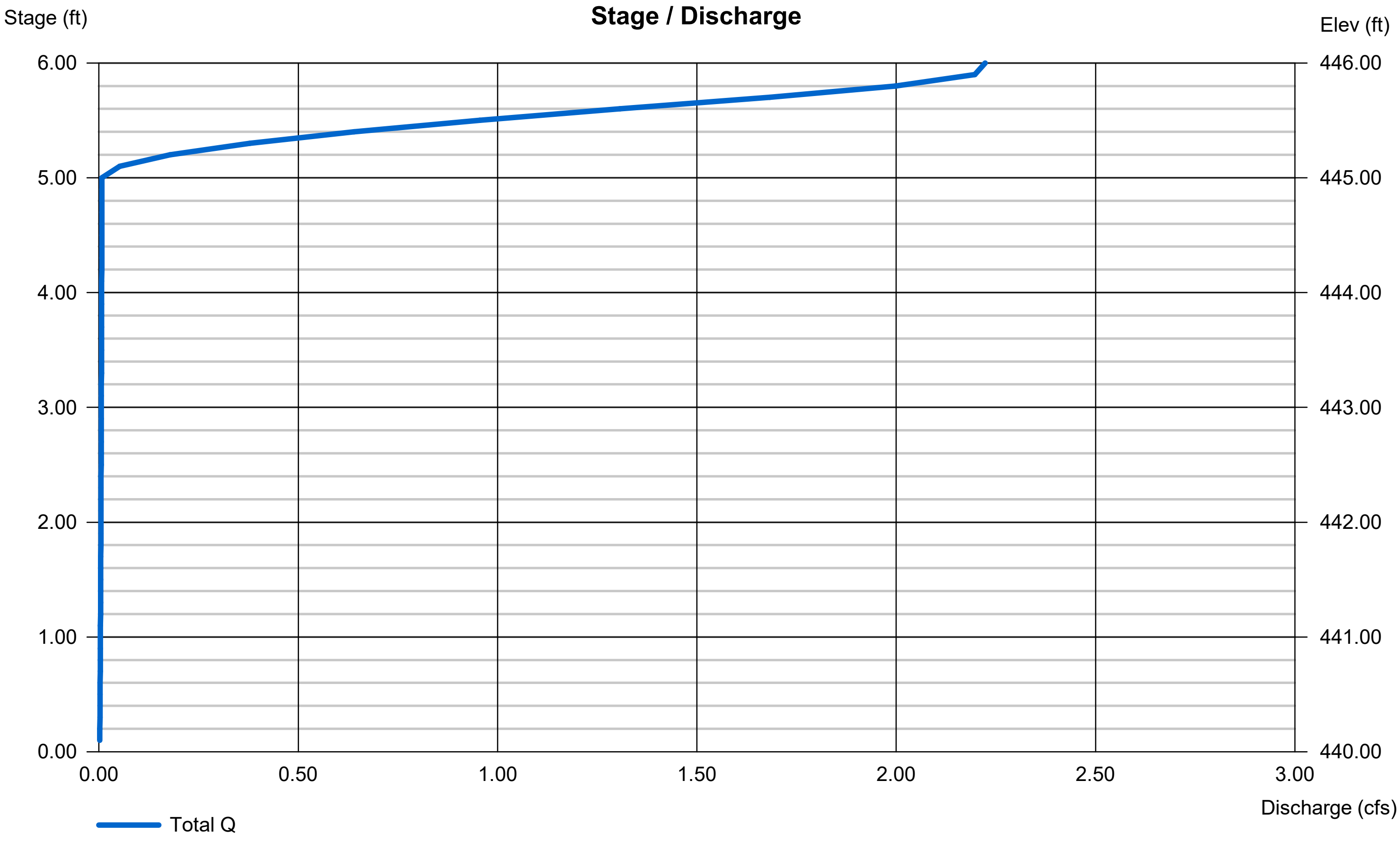
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

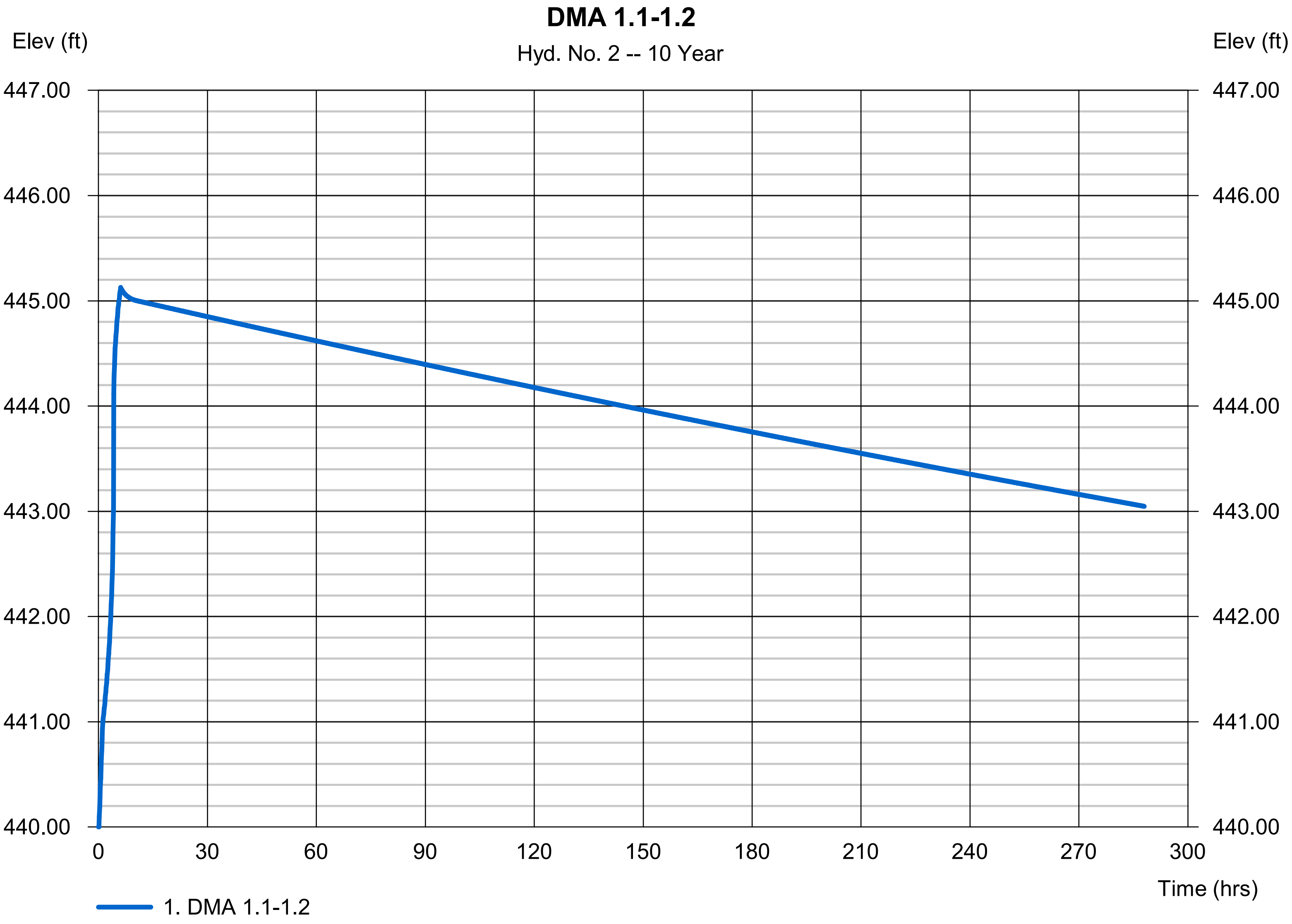
Hyd. No. 2

DMA 1.1-1.2

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 6 min
Inflow hyd. No. = 1 - DMA 1.1-1.2
Reservoir name = DMA 1.1-1.2

Peak discharge = 0.080 cfs
Time to peak = 6.10 hrs
Hyd. volume = 7,366 cuft
Max. Elevation = 445.13 ft
Max. Storage = 15,428 cuft

Storage Indication method used.



DMA 1.1/1.2 100 Year

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RATIONAL METHOD HYDROGRAPH PROGRAM

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RUN DATE   8/11/2016

TIME OF CONCENTRATION  5  MIN.

6 HOUR RAINFALL  3  INCHES

BASIN AREA  3.28  ACRES

RUNOFF COEFFICIENT  0.69

PEAK DISCHARGE  17.13  CFS


TIME (MIN) =  0  DISCHARGE (CFS) =  0

TIME (MIN) =  5  DISCHARGE (CFS) =  0.4

TIME (MIN) =  10  DISCHARGE (CFS) =  0.4

TIME (MIN) =  15  DISCHARGE (CFS) =  0.4

TIME (MIN) =  20  DISCHARGE (CFS) =  0.4

TIME (MIN) =  25  DISCHARGE (CFS) =  0.4

TIME (MIN) =  30  DISCHARGE (CFS) =  0.4

TIME (MIN) =  35  DISCHARGE (CFS) =  0.4

TIME (MIN) =  40  DISCHARGE (CFS) =  0.4

TIME (MIN) =  45  DISCHARGE (CFS) =  0.5

TIME (MIN) =  50  DISCHARGE (CFS) =  0.5

TIME (MIN) =  55  DISCHARGE (CFS) =  0.5

TIME (MIN) =  60  DISCHARGE (CFS) =  0.5

TIME (MIN) =  65  DISCHARGE (CFS) =  0.5

TIME (MIN) =  70  DISCHARGE (CFS) =  0.5

TIME (MIN) =  75  DISCHARGE (CFS) =  0.5

TIME (MIN) =  80  DISCHARGE (CFS) =  0.5

TIME (MIN) =  85  DISCHARGE (CFS) =  0.5
```

TIME (MIN) = 90 DISCHARGE (CFS) = 0.5
TIME (MIN) = 95 DISCHARGE (CFS) = 0.5
TIME (MIN) = 100 DISCHARGE (CFS) = 0.6
TIME (MIN) = 105 DISCHARGE (CFS) = 0.6
TIME (MIN) = 110 DISCHARGE (CFS) = 0.6
TIME (MIN) = 115 DISCHARGE (CFS) = 0.6
TIME (MIN) = 120 DISCHARGE (CFS) = 0.6
TIME (MIN) = 125 DISCHARGE (CFS) = 0.6
TIME (MIN) = 130 DISCHARGE (CFS) = 0.6
TIME (MIN) = 135 DISCHARGE (CFS) = 0.7
TIME (MIN) = 140 DISCHARGE (CFS) = 0.7
TIME (MIN) = 145 DISCHARGE (CFS) = 0.7
TIME (MIN) = 150 DISCHARGE (CFS) = 0.7
TIME (MIN) = 155 DISCHARGE (CFS) = 0.8
TIME (MIN) = 160 DISCHARGE (CFS) = 0.8
TIME (MIN) = 165 DISCHARGE (CFS) = 0.8
TIME (MIN) = 170 DISCHARGE (CFS) = 0.9
TIME (MIN) = 175 DISCHARGE (CFS) = 0.9
TIME (MIN) = 180 DISCHARGE (CFS) = 0.9
TIME (MIN) = 185 DISCHARGE (CFS) = 1
TIME (MIN) = 190 DISCHARGE (CFS) = 1
TIME (MIN) = 195 DISCHARGE (CFS) = 1.1
TIME (MIN) = 200 DISCHARGE (CFS) = 1.2
TIME (MIN) = 205 DISCHARGE (CFS) = 1.3
TIME (MIN) = 210 DISCHARGE (CFS) = 1.4
TIME (MIN) = 215 DISCHARGE (CFS) = 1.6
TIME (MIN) = 220 DISCHARGE (CFS) = 1.7
TIME (MIN) = 225 DISCHARGE (CFS) = 2.1
TIME (MIN) = 230 DISCHARGE (CFS) = 2.4

TIME (MIN) = 235 DISCHARGE (CFS) = 3.5

TIME (MIN) = 240 DISCHARGE (CFS) = 5.7

TIME (MIN) = 245 DISCHARGE (CFS) = 17.13

TIME (MIN) = 250 DISCHARGE (CFS) = 2.8

TIME (MIN) = 255 DISCHARGE (CFS) = 1.9

TIME (MIN) = 260 DISCHARGE (CFS) = 1.5

TIME (MIN) = 265 DISCHARGE (CFS) = 1.2

TIME (MIN) = 270 DISCHARGE (CFS) = 1.1

TIME (MIN) = 275 DISCHARGE (CFS) = 1

TIME (MIN) = 280 DISCHARGE (CFS) = 0.9

TIME (MIN) = 285 DISCHARGE (CFS) = 0.8

TIME (MIN) = 290 DISCHARGE (CFS) = 0.7

TIME (MIN) = 295 DISCHARGE (CFS) = 0.7

TIME (MIN) = 300 DISCHARGE (CFS) = 0.7

TIME (MIN) = 305 DISCHARGE (CFS) = 0.6

TIME (MIN) = 310 DISCHARGE (CFS) = 0.6

TIME (MIN) = 315 DISCHARGE (CFS) = 0.6

TIME (MIN) = 320 DISCHARGE (CFS) = 0.5

TIME (MIN) = 325 DISCHARGE (CFS) = 0.5

TIME (MIN) = 330 DISCHARGE (CFS) = 0.5

TIME (MIN) = 335 DISCHARGE (CFS) = 0.5

TIME (MIN) = 340 DISCHARGE (CFS) = 0.5

TIME (MIN) = 345 DISCHARGE (CFS) = 0.5

TIME (MIN) = 350 DISCHARGE (CFS) = 0.4

TIME (MIN) = 355 DISCHARGE (CFS) = 0.4

TIME (MIN) = 360 DISCHARGE (CFS) = 0.4

TIME (MIN) = 365 DISCHARGE (CFS) = 0

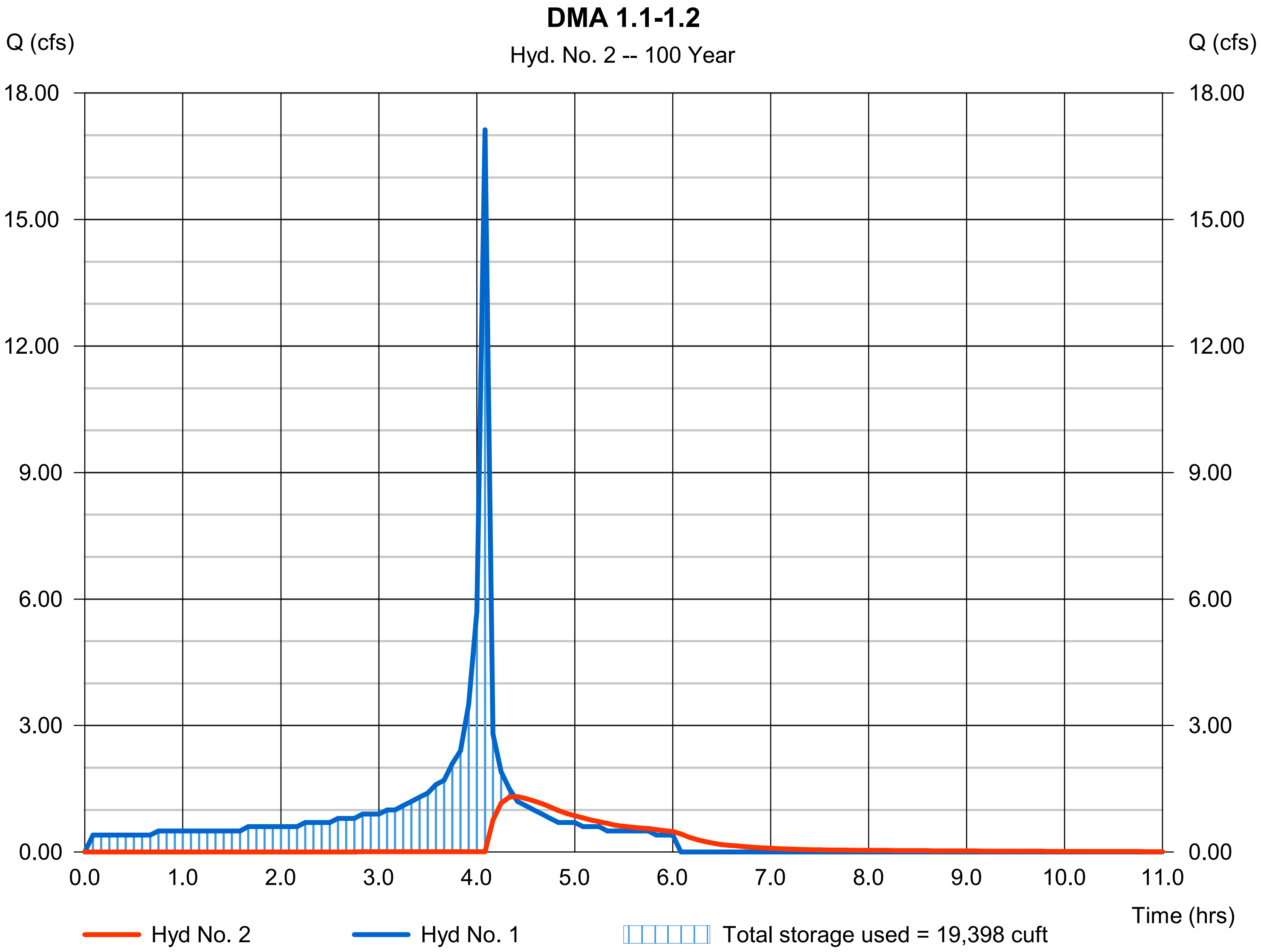
Hydrograph Report

Hyd. No. 2

DMA 1.1-1.2

Hydrograph type	= Reservoir	Peak discharge	= 1.317 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.42 hrs
Time interval	= 5 min	Hyd. volume	= 12,740 cuft
Inflow hyd. No.	= 1 - DMA 1.1-1.2	Max. Elevation	= 445.61 ft
Reservoir name	= Cistern 1.1-1.2	Max. Storage	= 19,398 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Cistern 1.1-1.2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 440.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	440.00	3,645	0	0
1.00	441.00	3,645	3,462	3,462
2.00	442.00	3,645	3,462	6,925
3.00	443.00	3,645	3,462	10,387
4.00	444.00	3,645	3,462	13,850
5.00	445.00	3,645	3,462	17,312
6.00	446.00	3,645	3,462	20,774
7.00	447.00	3,645	3,462	24,237
8.00	448.00	3,645	3,462	27,699
9.00	449.00	3,645	3,462	31,162

Culvert / Orifice Structures

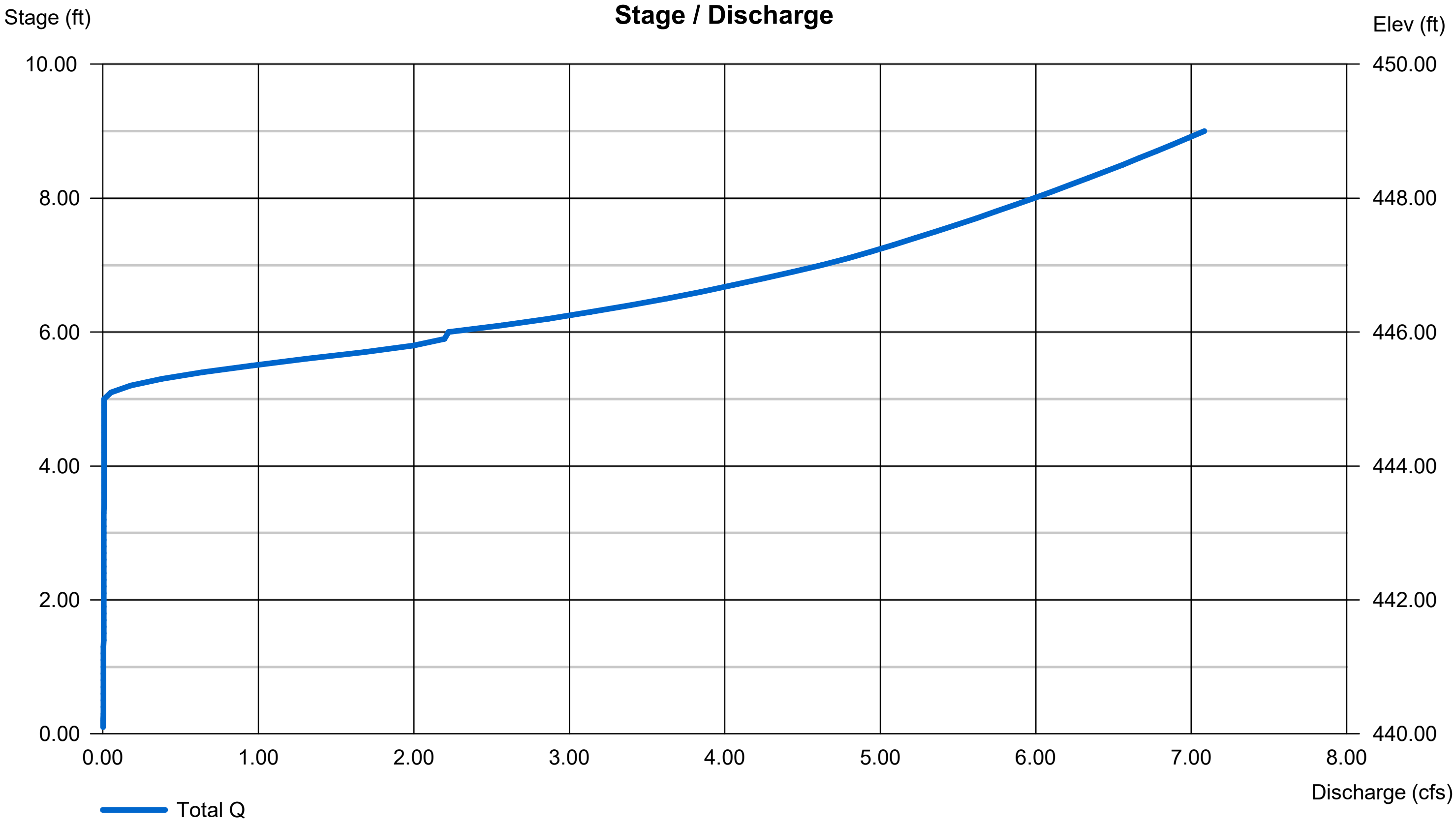
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.70	12.00	0.00	0.00
Span (in)	= 0.70	12.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 440.00	445.00	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



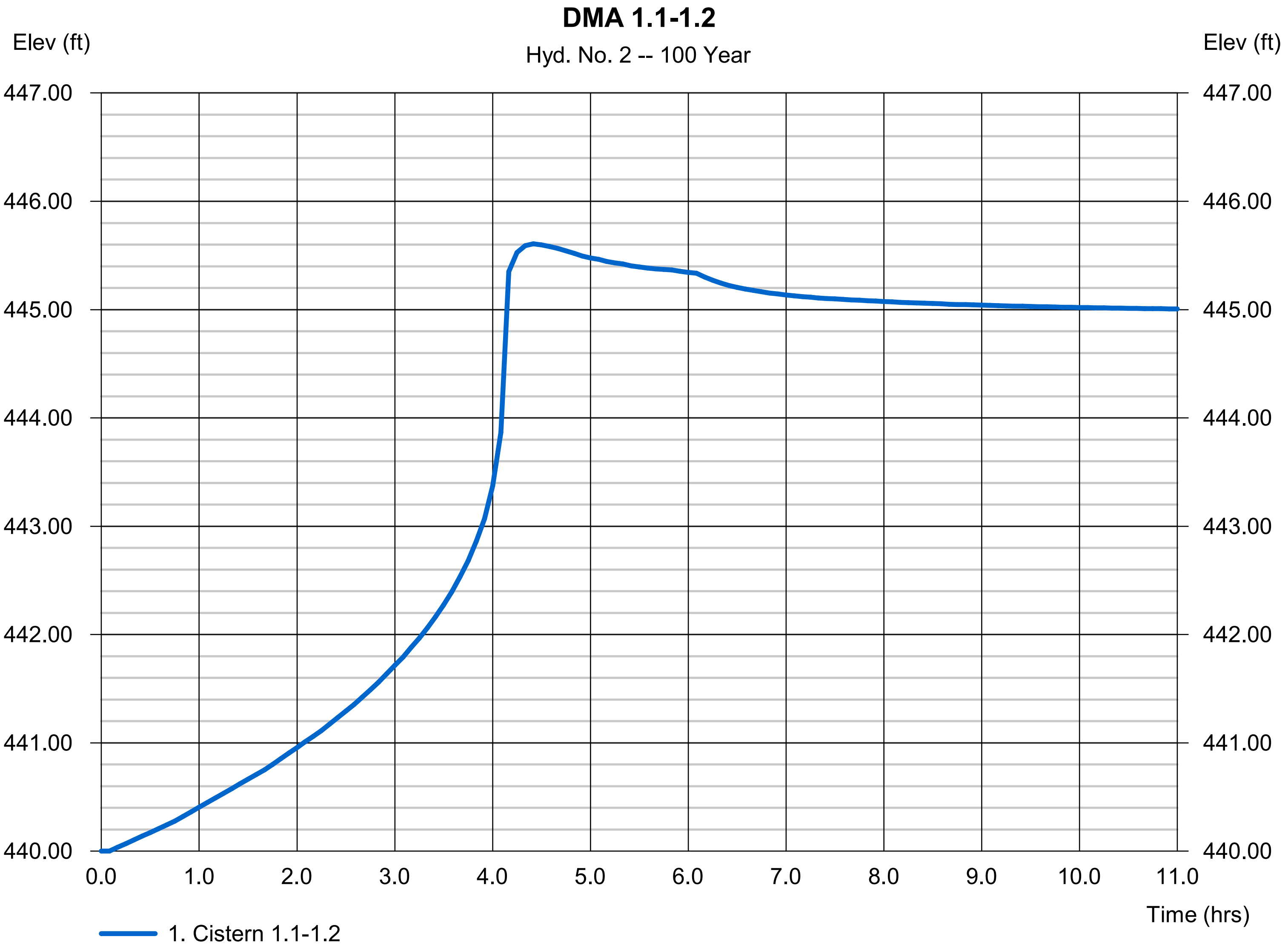
Hydrograph Report

Hyd. No. 2

DMA 1.1-1.2

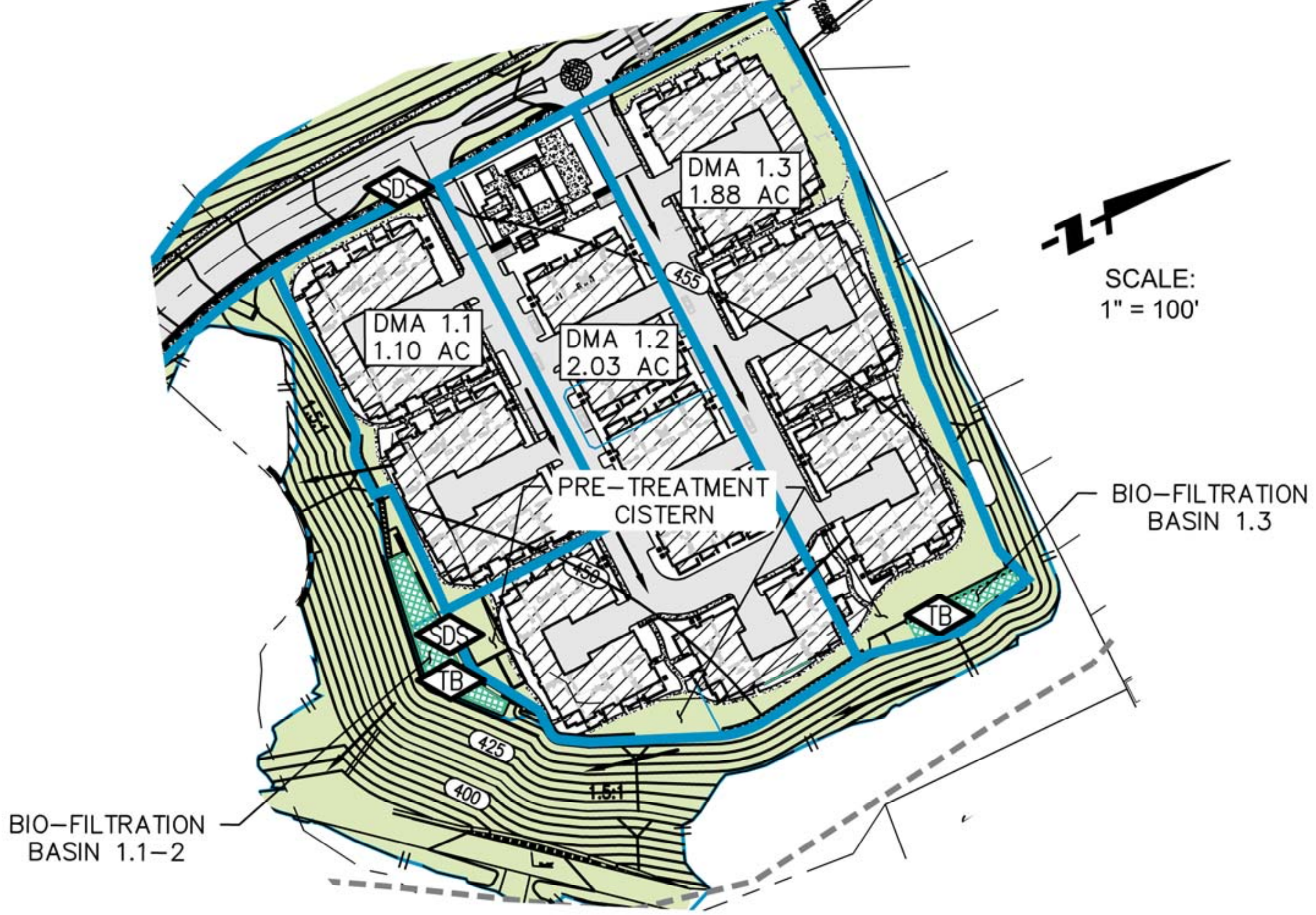
Hydrograph type	= Reservoir	Peak discharge	= 1.317 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.42 hrs
Time interval	= 5 min	Hyd. volume	= 12,740 cuft
Inflow hyd. No.	= 1 - DMA 1.1-1.2	Max. Elevation	= 445.61 ft
Reservoir name	= Cistern 1.1-1.2	Max. Storage	= 19,398 cuft

Storage Indication method used.



STRUCTURAL BMP DMA MAPBOOK

DMA1.1, 1.2, 1.3 / BMP1.1-2 & 1.3



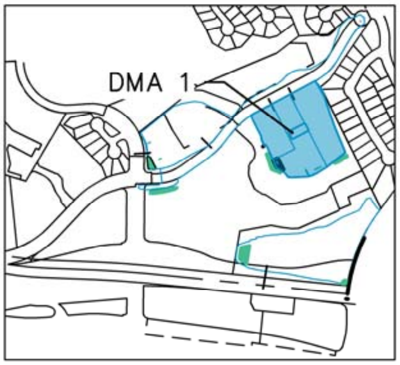
DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
1.1	1.1-2	2-HOA	*BF BASIN + CISTERN	✓	✓
1.2	1.1-2	2-HOA	*BF BASIN + CISTERN	✓	✓
1.3	1.3	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB

INDEX MAP
NO SCALE

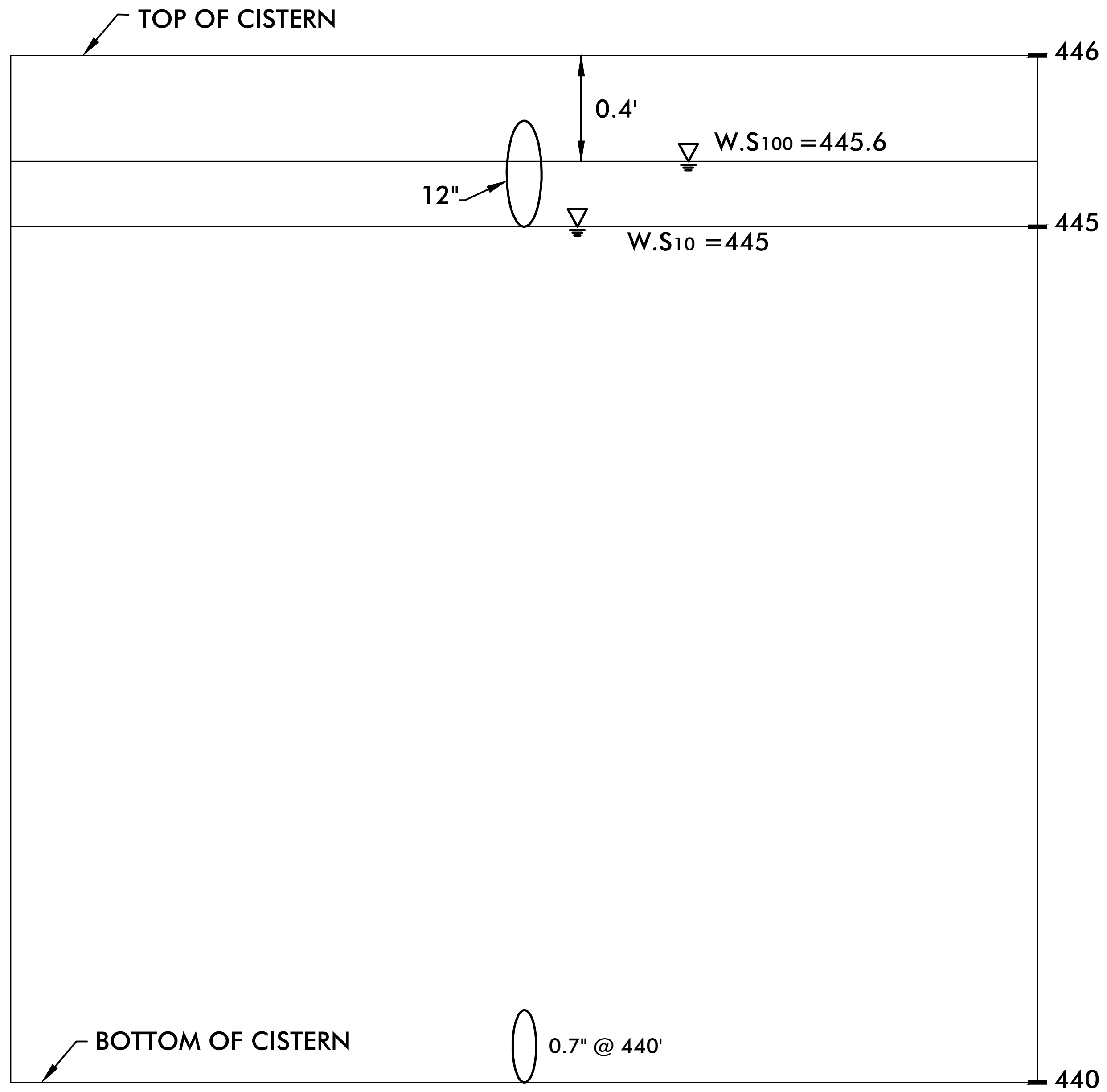


FUSCOE
ENGINEERING

16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\SWMP\BMP DMA MAPBOOK\DMA 1.DWG (10-18-2016 9:48:05AM) Plotted by: ESMITH

DMA 1.1, 1.2



COMBINED AREA= 3,645 SF

SWEETWATER VISTAS
DMA 1.1, 1.2
DATE: 10/10/16

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ° fax 858.597.0335
www.fuscoe.com

DMA 1.3

10 Year

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RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/12/2016
TIME OF CONCENTRATION  6  MIN.
6 HOUR RAINFALL  1.9  INCHES
BASIN AREA  1.96  ACRES
RUNOFF COEFFICIENT  0.69
PEAK DISCHARGE  6.18  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  6  DISCHARGE (CFS) =  0.2
TIME (MIN) =  12  DISCHARGE (CFS) =  0.2
TIME (MIN) =  18  DISCHARGE (CFS) =  0.2
TIME (MIN) =  24  DISCHARGE (CFS) =  0.2
TIME (MIN) =  30  DISCHARGE (CFS) =  0.2
TIME (MIN) =  36  DISCHARGE (CFS) =  0.2
TIME (MIN) =  42  DISCHARGE (CFS) =  0.2
TIME (MIN) =  48  DISCHARGE (CFS) =  0.2
TIME (MIN) =  54  DISCHARGE (CFS) =  0.2
TIME (MIN) =  60  DISCHARGE (CFS) =  0.2
TIME (MIN) =  66  DISCHARGE (CFS) =  0.2
TIME (MIN) =  72  DISCHARGE (CFS) =  0.2
TIME (MIN) =  78  DISCHARGE (CFS) =  0.2
TIME (MIN) =  84  DISCHARGE (CFS) =  0.2
TIME (MIN) =  90  DISCHARGE (CFS) =  0.2
```

```
TIME (MIN) =  96  DISCHARGE (CFS) =  0.2
TIME (MIN) =  102  DISCHARGE (CFS) =  0.2
TIME (MIN) =  108  DISCHARGE (CFS) =  0.2
TIME (MIN) =  114  DISCHARGE (CFS) =  0.2
TIME (MIN) =  120  DISCHARGE (CFS) =  0.2
TIME (MIN) =  126  DISCHARGE (CFS) =  0.2
TIME (MIN) =  132  DISCHARGE (CFS) =  0.2
TIME (MIN) =  138  DISCHARGE (CFS) =  0.3
TIME (MIN) =  144  DISCHARGE (CFS) =  0.3
TIME (MIN) =  150  DISCHARGE (CFS) =  0.3
TIME (MIN) =  156  DISCHARGE (CFS) =  0.3
TIME (MIN) =  162  DISCHARGE (CFS) =  0.3
TIME (MIN) =  168  DISCHARGE (CFS) =  0.3
TIME (MIN) =  174  DISCHARGE (CFS) =  0.3
TIME (MIN) =  180  DISCHARGE (CFS) =  0.4
TIME (MIN) =  186  DISCHARGE (CFS) =  0.4
TIME (MIN) =  192  DISCHARGE (CFS) =  0.4
TIME (MIN) =  198  DISCHARGE (CFS) =  0.4
TIME (MIN) =  204  DISCHARGE (CFS) =  0.5
TIME (MIN) =  210  DISCHARGE (CFS) =  0.5
TIME (MIN) =  216  DISCHARGE (CFS) =  0.6
TIME (MIN) =  222  DISCHARGE (CFS) =  0.7
TIME (MIN) =  228  DISCHARGE (CFS) =  0.8
TIME (MIN) =  234  DISCHARGE (CFS) =  1.2
TIME (MIN) =  240  DISCHARGE (CFS) =  1.5
TIME (MIN) =  246  DISCHARGE (CFS) =  6.18
TIME (MIN) =  252  DISCHARGE (CFS) =  1
TIME (MIN) =  258  DISCHARGE (CFS) =  0.6
TIME (MIN) =  264  DISCHARGE (CFS) =  0.5
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```
TIME (MIN) =  270  DISCHARGE (CFS) =  0.4
TIME (MIN) =  276  DISCHARGE (CFS) =  0.4
TIME (MIN) =  282  DISCHARGE (CFS) =  0.3
TIME (MIN) =  288  DISCHARGE (CFS) =  0.3
TIME (MIN) =  294  DISCHARGE (CFS) =  0.3
TIME (MIN) =  300  DISCHARGE (CFS) =  0.3
TIME (MIN) =  306  DISCHARGE (CFS) =  0.2
TIME (MIN) =  312  DISCHARGE (CFS) =  0.2
TIME (MIN) =  318  DISCHARGE (CFS) =  0.2
TIME (MIN) =  324  DISCHARGE (CFS) =  0.2
TIME (MIN) =  330  DISCHARGE (CFS) =  0.2
TIME (MIN) =  336  DISCHARGE (CFS) =  0.2
TIME (MIN) =  342  DISCHARGE (CFS) =  0.2
TIME (MIN) =  348  DISCHARGE (CFS) =  0.2
TIME (MIN) =  354  DISCHARGE (CFS) =  0.2
TIME (MIN) =  360  DISCHARGE (CFS) =  0.2
TIME (MIN) =  366  DISCHARGE (CFS) =  0
```

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 10 / 7 / 2016

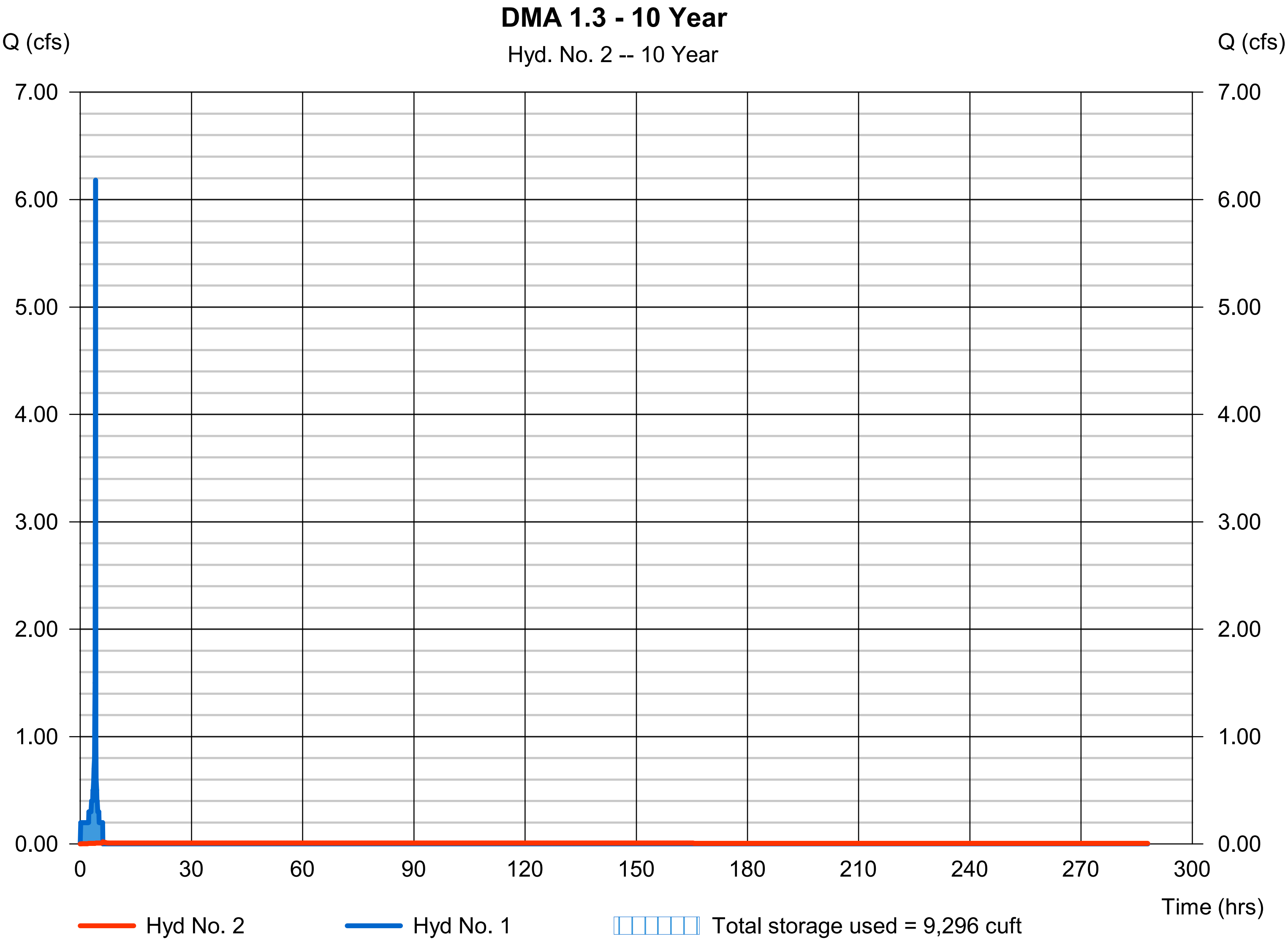
Hyd. No. 2

DMA 1.3 - 10 Year

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 6 min
Inflow hyd. No. = 1 - DMA 1.3 - 10 Year
Reservoir name = DMA 1.3

Peak discharge = 0.020 cfs
Time to peak = 6.10 hrs
Hyd. volume = 7,287 cuft
Max. Elevation = 450.63 ft
Max. Storage = 9,296 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DMA 1.3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 447.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	447.00	2,700	0	0
1.00	448.00	2,700	2,565	2,565
2.00	449.00	2,700	2,565	5,129
3.00	450.00	2,700	2,565	7,694
4.00	451.00	2,700	2,565	10,259
5.00	452.00	2,700	2,565	12,824

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.80	12.00	0.00	0.00
Span (in)	= 0.80	12.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 447.00	450.60	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

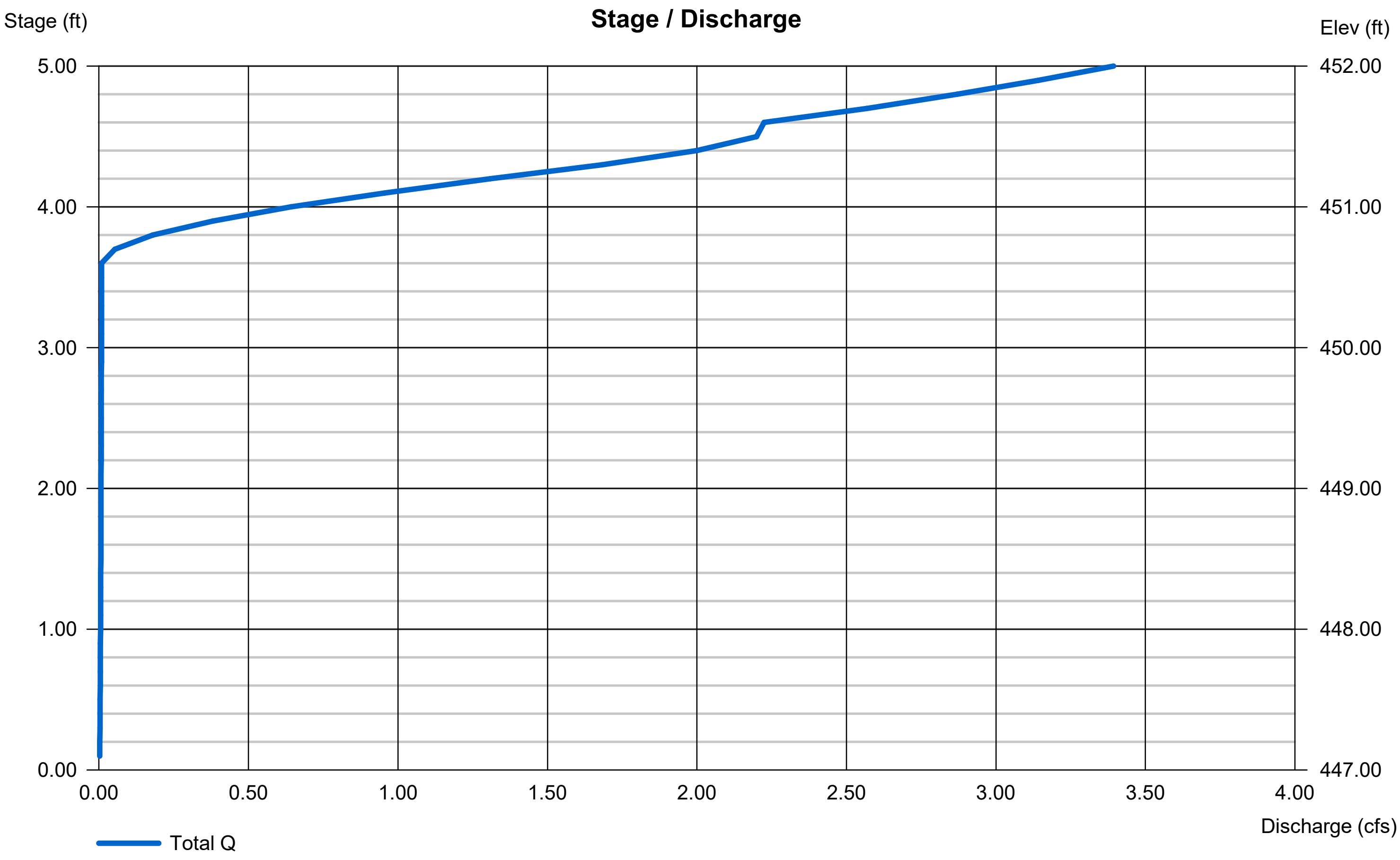
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

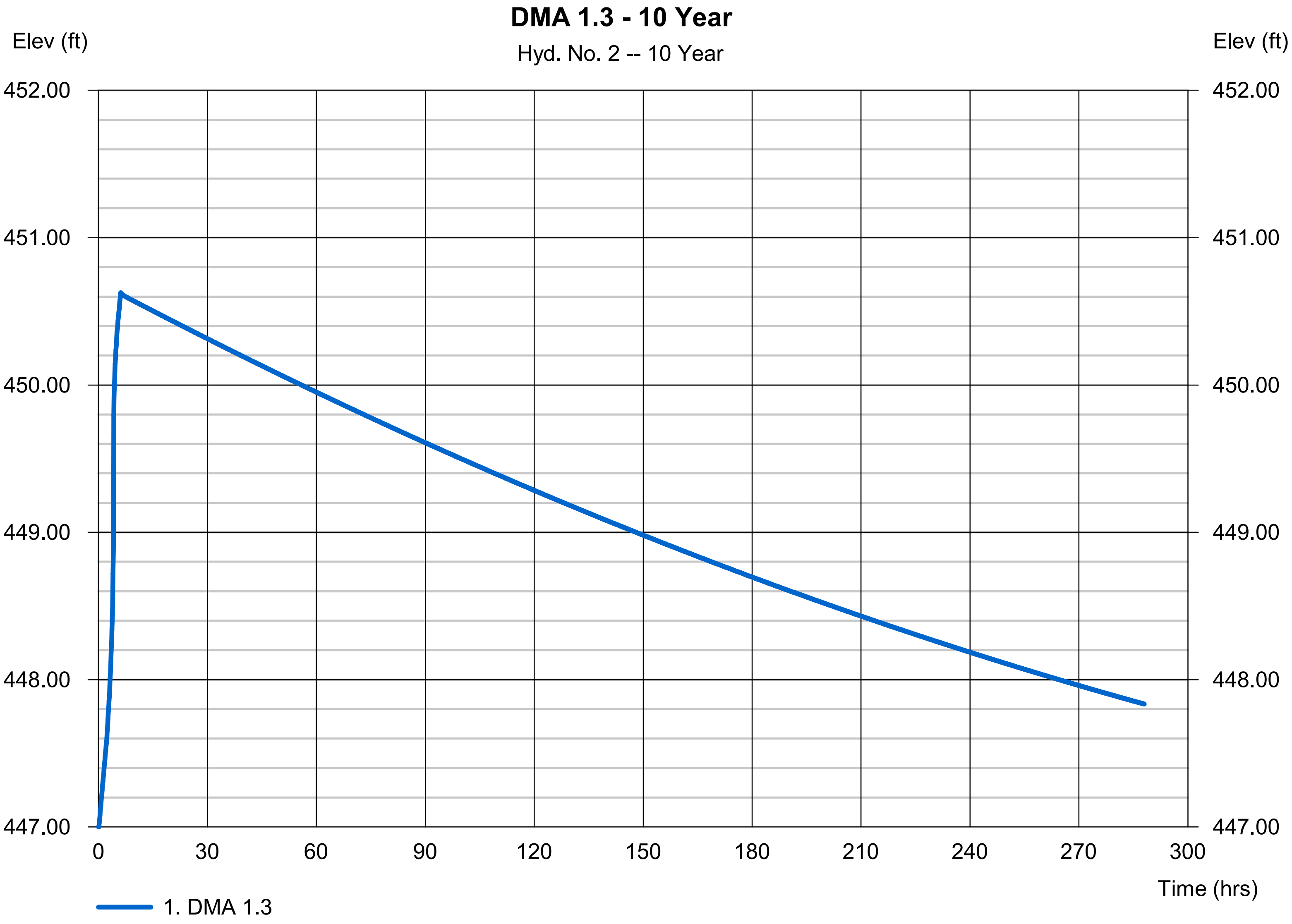
Hyd. No. 2

DMA 1.3 - 10 Year

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 6 min
Inflow hyd. No. = 1 - DMA 1.3 - 10 Year
Reservoir name = DMA 1.3

Peak discharge = 0.020 cfs
Time to peak = 6.10 hrs
Hyd. volume = 7,287 cuft
Max. Elevation = 450.63 ft
Max. Storage = 9,296 cuft

Storage Indication method used.



DMA 1.3

100 Year

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RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/11/2016
TIME OF CONCENTRATION  5  MIN.
6 HOUR RAINFALL  3  INCHES
BASIN AREA  1.96  ACRES
RUNOFF COEFFICIENT  0.69
PEAK DISCHARGE  10.14  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  5  DISCHARGE (CFS) =  0.2
TIME (MIN) =  10  DISCHARGE (CFS) =  0.2
TIME (MIN) =  15  DISCHARGE (CFS) =  0.2
TIME (MIN) =  20  DISCHARGE (CFS) =  0.3
TIME (MIN) =  25  DISCHARGE (CFS) =  0.3
TIME (MIN) =  30  DISCHARGE (CFS) =  0.3
TIME (MIN) =  35  DISCHARGE (CFS) =  0.3
TIME (MIN) =  40  DISCHARGE (CFS) =  0.3
TIME (MIN) =  45  DISCHARGE (CFS) =  0.3
TIME (MIN) =  50  DISCHARGE (CFS) =  0.3
TIME (MIN) =  55  DISCHARGE (CFS) =  0.3
TIME (MIN) =  60  DISCHARGE (CFS) =  0.3
TIME (MIN) =  65  DISCHARGE (CFS) =  0.3
TIME (MIN) =  70  DISCHARGE (CFS) =  0.3
TIME (MIN) =  75  DISCHARGE (CFS) =  0.3
TIME (MIN) =  80  DISCHARGE (CFS) =  0.3
```

TIME (MIN) = 85 DISCHARGE (CFS) = 0.3

TIME (MIN) = 90 DISCHARGE (CFS) = 0.3

TIME (MIN) = 95 DISCHARGE (CFS) = 0.3

TIME (MIN) = 100 DISCHARGE (CFS) = 0.3

TIME (MIN) = 105 DISCHARGE (CFS) = 0.3

TIME (MIN) = 110 DISCHARGE (CFS) = 0.3

TIME (MIN) = 115 DISCHARGE (CFS) = 0.4

TIME (MIN) = 120 DISCHARGE (CFS) = 0.4

TIME (MIN) = 125 DISCHARGE (CFS) = 0.4

TIME (MIN) = 130 DISCHARGE (CFS) = 0.4

TIME (MIN) = 135 DISCHARGE (CFS) = 0.4

TIME (MIN) = 140 DISCHARGE (CFS) = 0.4

TIME (MIN) = 145 DISCHARGE (CFS) = 0.4

TIME (MIN) = 150 DISCHARGE (CFS) = 0.4

TIME (MIN) = 155 DISCHARGE (CFS) = 0.5

TIME (MIN) = 160 DISCHARGE (CFS) = 0.5

TIME (MIN) = 165 DISCHARGE (CFS) = 0.5

TIME (MIN) = 170 DISCHARGE (CFS) = 0.5

TIME (MIN) = 175 DISCHARGE (CFS) = 0.5

TIME (MIN) = 180 DISCHARGE (CFS) = 0.6

TIME (MIN) = 185 DISCHARGE (CFS) = 0.6

TIME (MIN) = 190 DISCHARGE (CFS) = 0.6

TIME (MIN) = 195 DISCHARGE (CFS) = 0.7

TIME (MIN) = 200 DISCHARGE (CFS) = 0.7

TIME (MIN) = 205 DISCHARGE (CFS) = 0.8

TIME (MIN) = 210 DISCHARGE (CFS) = 0.8

TIME (MIN) = 215 DISCHARGE (CFS) = 1

TIME (MIN) = 220 DISCHARGE (CFS) = 1

TIME (MIN) = 225 DISCHARGE (CFS) = 1.3

```
TIME (MIN) =  230  DISCHARGE (CFS) =  1.4
TIME (MIN) =  235  DISCHARGE (CFS) =  2.1
TIME (MIN) =  240  DISCHARGE (CFS) =  3.5
TIME (MIN) =  245  DISCHARGE (CFS) =  10.14
TIME (MIN) =  250  DISCHARGE (CFS) =  1.7
TIME (MIN) =  255  DISCHARGE (CFS) =  1.1
TIME (MIN) =  260  DISCHARGE (CFS) =  0.9
TIME (MIN) =  265  DISCHARGE (CFS) =  0.7
TIME (MIN) =  270  DISCHARGE (CFS) =  0.6
TIME (MIN) =  275  DISCHARGE (CFS) =  0.6
TIME (MIN) =  280  DISCHARGE (CFS) =  0.5
TIME (MIN) =  285  DISCHARGE (CFS) =  0.5
TIME (MIN) =  290  DISCHARGE (CFS) =  0.4
TIME (MIN) =  295  DISCHARGE (CFS) =  0.4
TIME (MIN) =  300  DISCHARGE (CFS) =  0.4
TIME (MIN) =  305  DISCHARGE (CFS) =  0.4
TIME (MIN) =  310  DISCHARGE (CFS) =  0.4
TIME (MIN) =  315  DISCHARGE (CFS) =  0.3
TIME (MIN) =  320  DISCHARGE (CFS) =  0.3
TIME (MIN) =  325  DISCHARGE (CFS) =  0.3
TIME (MIN) =  330  DISCHARGE (CFS) =  0.3
TIME (MIN) =  335  DISCHARGE (CFS) =  0.3
TIME (MIN) =  340  DISCHARGE (CFS) =  0.3
TIME (MIN) =  345  DISCHARGE (CFS) =  0.3
TIME (MIN) =  350  DISCHARGE (CFS) =  0.3
TIME (MIN) =  355  DISCHARGE (CFS) =  0.3
TIME (MIN) =  360  DISCHARGE (CFS) =  0.2
TIME (MIN) =  365  DISCHARGE (CFS) =  0
```

Hydrograph Report

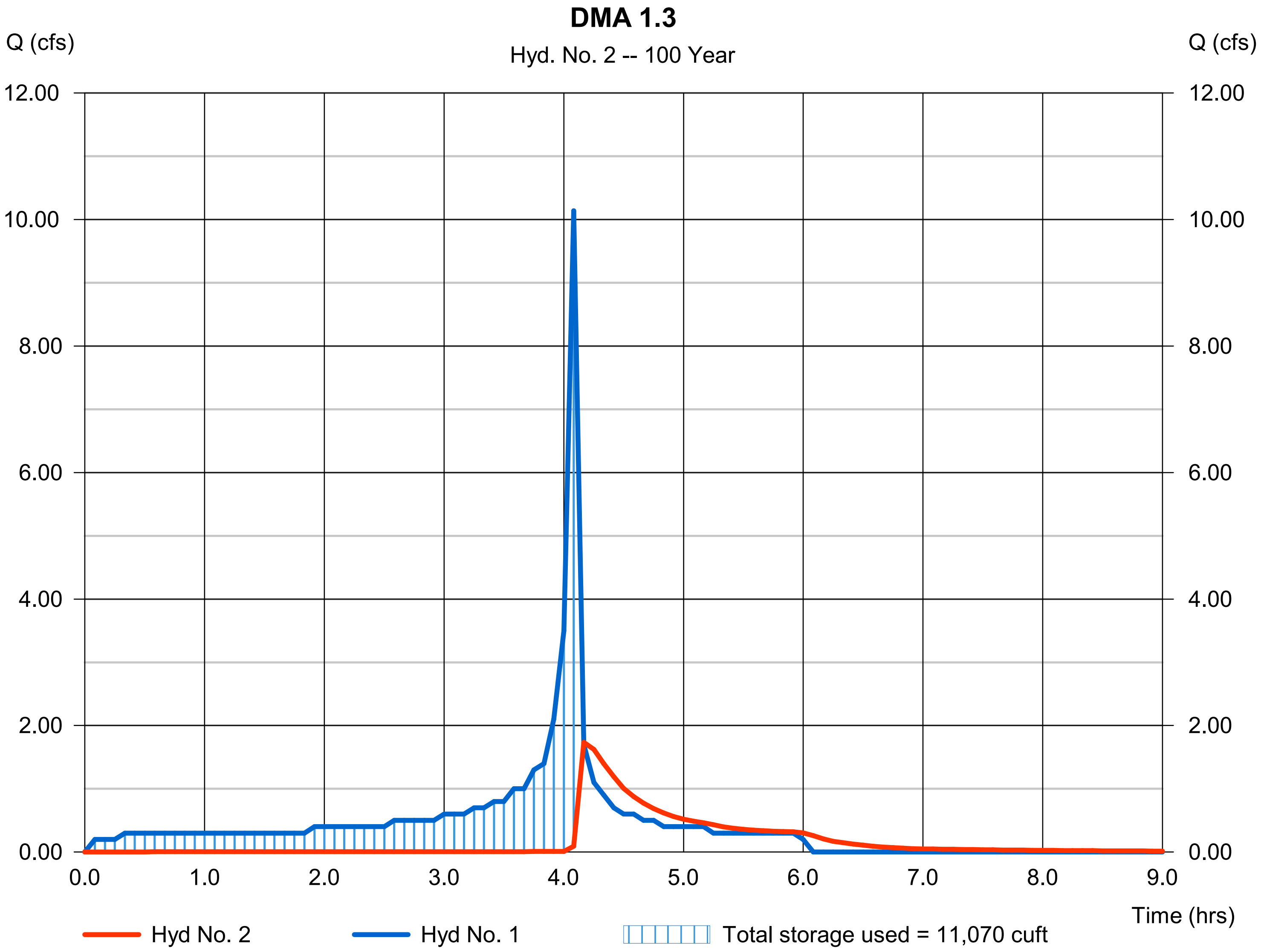
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 10 / 7 / 2016

Hyd. No. 2

DMA 1.3

Hydrograph type	= Reservoir	Peak discharge	= 1.734 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 11,534 cuft
Inflow hyd. No.	= 1 - DMA 1.3	Max. Elevation	= 451.32 ft
Reservoir name	= DMA 1.3	Max. Storage	= 11,070 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DMA 1.3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 447.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	447.00	2,700	0	0
1.00	448.00	2,700	2,565	2,565
2.00	449.00	2,700	2,565	5,129
3.00	450.00	2,700	2,565	7,694
4.00	451.00	2,700	2,565	10,259
5.00	452.00	2,700	2,565	12,824
6.00	453.00	2,700	2,565	15,388
7.00	454.00	2,700	2,565	17,953
8.00	455.00	2,700	2,565	20,518

Culvert / Orifice Structures

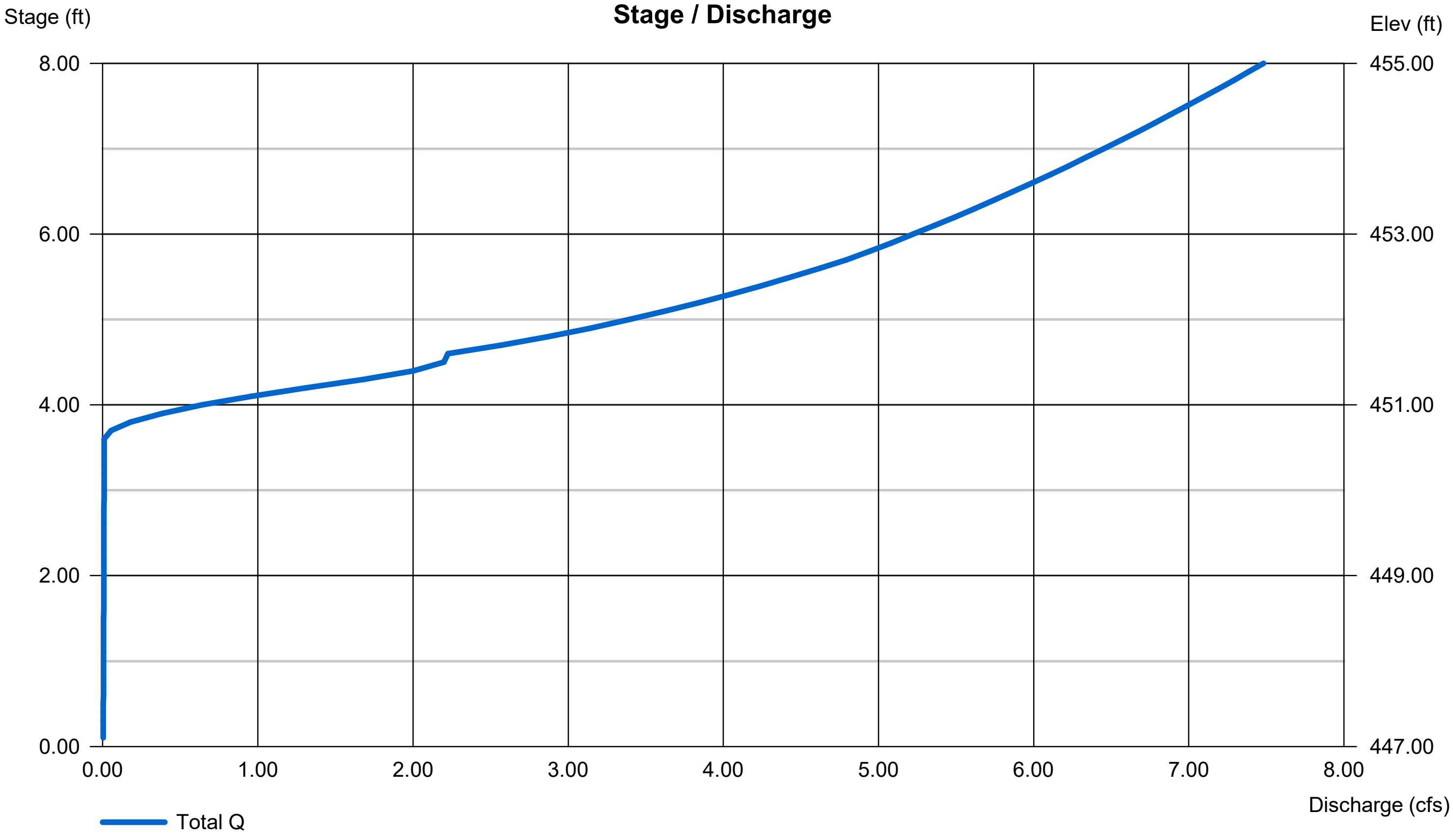
		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	0.80	12.00	0.00	0.00
Span (in)	=	0.80	12.00	0.00	0.00
No. Barrels	=	1	1	0	0
Invert El. (ft)	=	447.00	450.60	0.00	0.00
Length (ft)	=	30.00	30.00	0.00	0.00
Slope (%)	=	1.00	1.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	No	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	0.00	0.00	0.00	0.00
Crest El. (ft)	=	0.00	0.00	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	---	---	---	---
Multi-Stage	=	No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



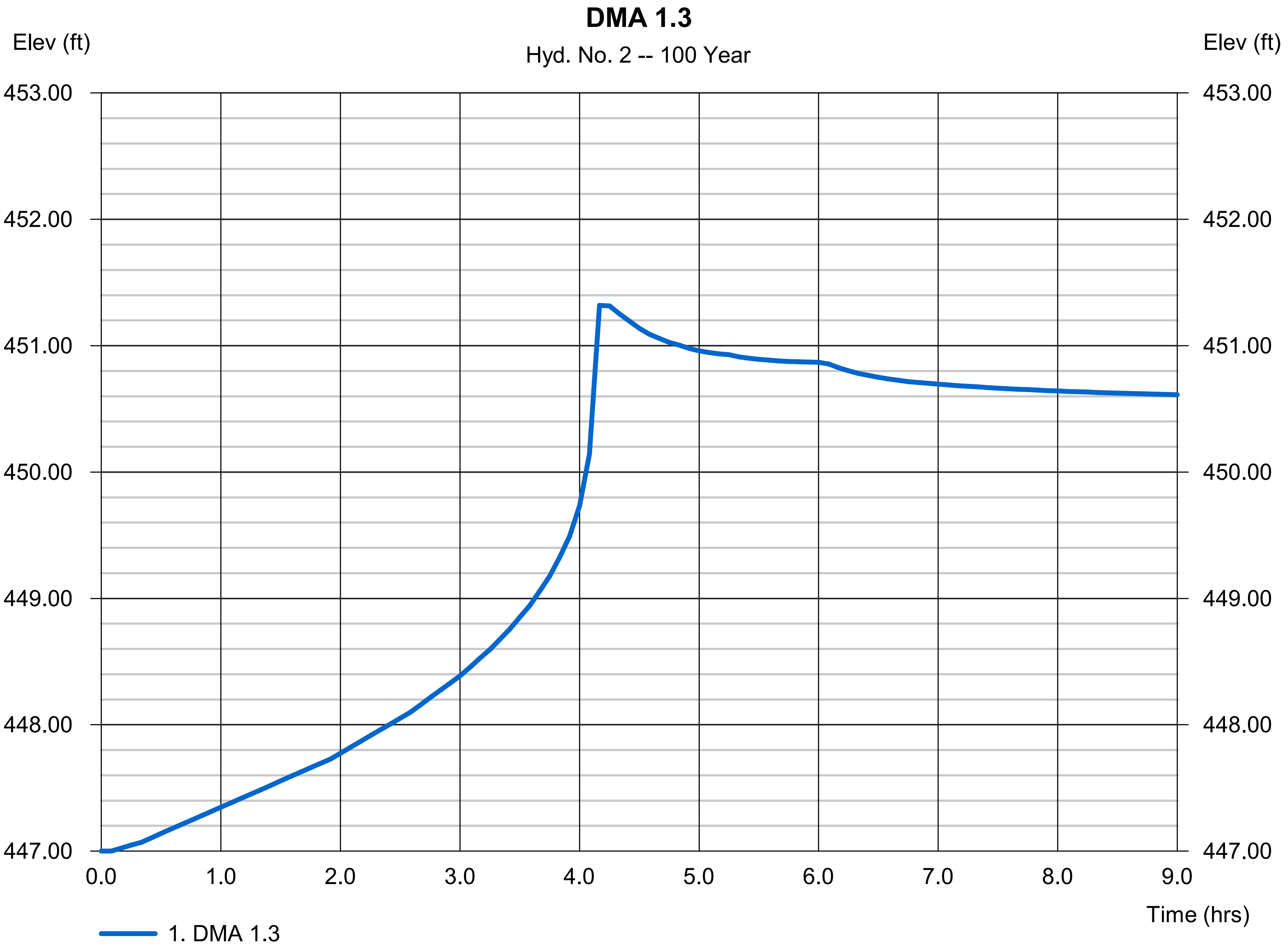
Hydrograph Report

Hyd. No. 2

DMA 1.3

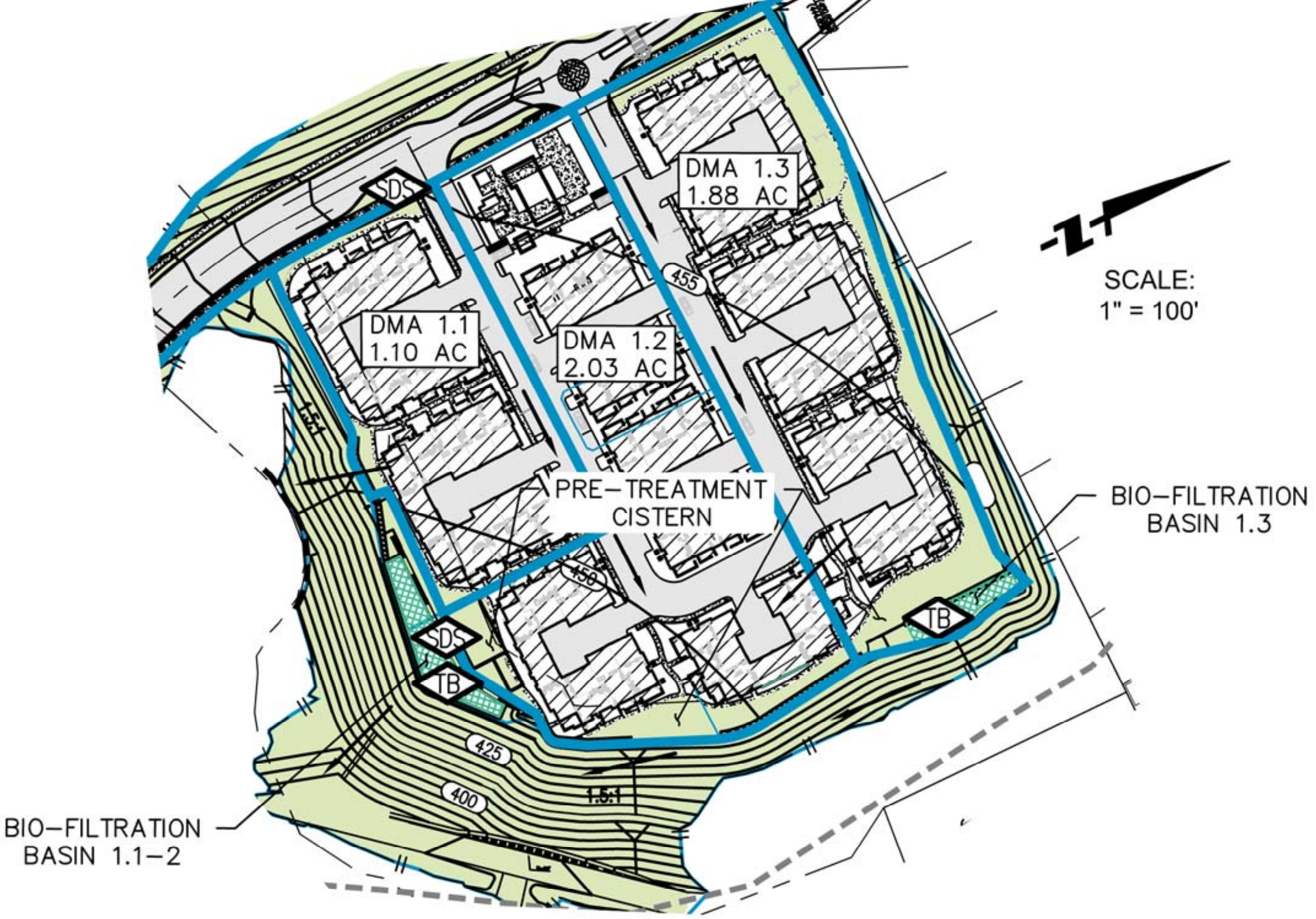
Hydrograph type	= Reservoir	Peak discharge	= 1.734 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.17 hrs
Time interval	= 5 min	Hyd. volume	= 11,534 cuft
Inflow hyd. No.	= 1 - DMA 1.3	Max. Elevation	= 451.32 ft
Reservoir name	= DMA 1.3	Max. Storage	= 11,070 cuft

Storage Indication method used.



STRUCTURAL BMP DMA MAPBOOK

DMA1.1, 1.2, 1.3 / BMP1.1-2 & 1.3



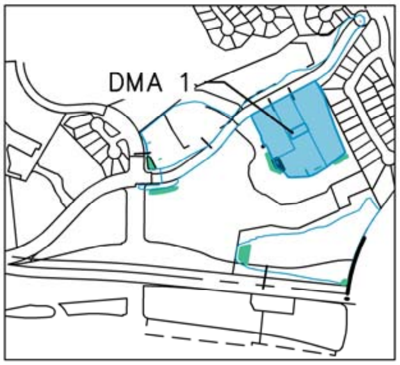
DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
1.1	1.1-2	2-HOA	*BF BASIN + CISTERN	✓	✓
1.2	1.1-2	2-HOA	*BF BASIN + CISTERN	✓	✓
1.3	1.3	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB

INDEX MAP
NO SCALE



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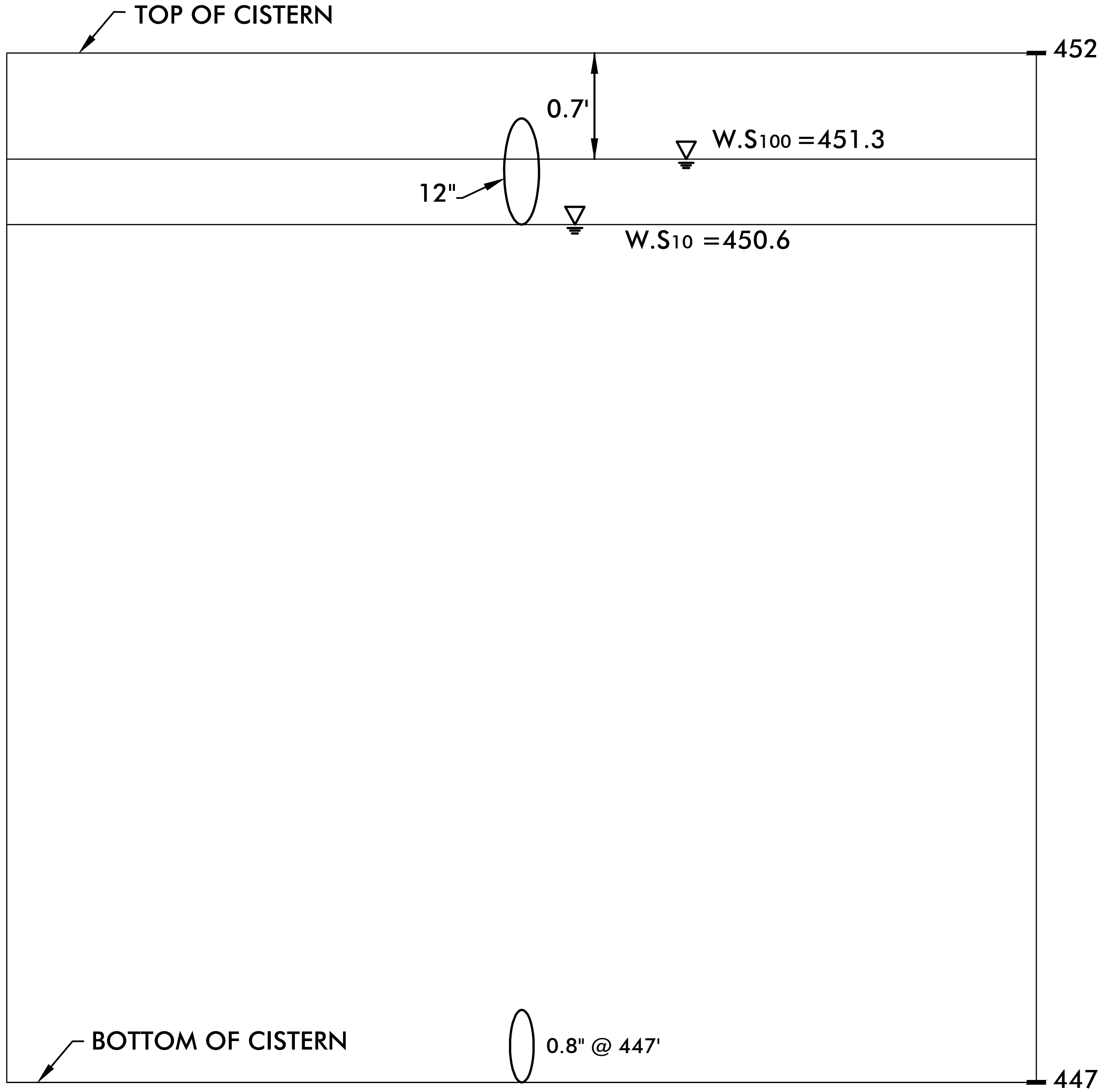
F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\SWMP\BMP DMA MAPBOOK\DMA 1.DWG (10–18–2016 9:48:05AM) Plotted by: ESMITH

DMA 1.3



AREA= 2,700 SF

SWEETWATER VISTAS
DMA 1.3
DATE: 10/10/16

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ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ° fax 858.597.0335
www.fuscoe.com

DMA 2

10 YEAR

```
RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/12/2016
TIME OF CONCENTRATION  5  MIN.
6 HOUR RAINFALL  1.9  INCHES
BASIN AREA  3.26  ACRES
RUNOFF COEFFICIENT  0.69
PEAK DISCHARGE  11.43  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  5  DISCHARGE (CFS) =  0.3
TIME (MIN) =  10  DISCHARGE (CFS) =  0.3
TIME (MIN) =  15  DISCHARGE (CFS) =  0.3
TIME (MIN) =  20  DISCHARGE (CFS) =  0.3
TIME (MIN) =  25  DISCHARGE (CFS) =  0.3
TIME (MIN) =  30  DISCHARGE (CFS) =  0.3
TIME (MIN) =  35  DISCHARGE (CFS) =  0.3
TIME (MIN) =  40  DISCHARGE (CFS) =  0.3
TIME (MIN) =  45  DISCHARGE (CFS) =  0.3
TIME (MIN) =  50  DISCHARGE (CFS) =  0.3
TIME (MIN) =  55  DISCHARGE (CFS) =  0.3
TIME (MIN) =  60  DISCHARGE (CFS) =  0.3
TIME (MIN) =  65  DISCHARGE (CFS) =  0.3
TIME (MIN) =  70  DISCHARGE (CFS) =  0.3
TIME (MIN) =  75  DISCHARGE (CFS) =  0.3
```

```
TIME (MIN) =  80  DISCHARGE (CFS) =  0.3

TIME (MIN) =  85  DISCHARGE (CFS) =  0.3

TIME (MIN) =  90  DISCHARGE (CFS) =  0.3

TIME (MIN) =  95  DISCHARGE (CFS) =  0.3

TIME (MIN) =  100  DISCHARGE (CFS) =  0.4

TIME (MIN) =  105  DISCHARGE (CFS) =  0.4

TIME (MIN) =  110  DISCHARGE (CFS) =  0.4

TIME (MIN) =  115  DISCHARGE (CFS) =  0.4

TIME (MIN) =  120  DISCHARGE (CFS) =  0.4

TIME (MIN) =  125  DISCHARGE (CFS) =  0.4

TIME (MIN) =  130  DISCHARGE (CFS) =  0.4

TIME (MIN) =  135  DISCHARGE (CFS) =  0.4

TIME (MIN) =  140  DISCHARGE (CFS) =  0.4

TIME (MIN) =  145  DISCHARGE (CFS) =  0.5

TIME (MIN) =  150  DISCHARGE (CFS) =  0.5

TIME (MIN) =  155  DISCHARGE (CFS) =  0.5

TIME (MIN) =  160  DISCHARGE (CFS) =  0.5

TIME (MIN) =  165  DISCHARGE (CFS) =  0.5

TIME (MIN) =  170  DISCHARGE (CFS) =  0.5

TIME (MIN) =  175  DISCHARGE (CFS) =  0.6

TIME (MIN) =  180  DISCHARGE (CFS) =  0.6

TIME (MIN) =  185  DISCHARGE (CFS) =  0.6

TIME (MIN) =  190  DISCHARGE (CFS) =  0.7

TIME (MIN) =  195  DISCHARGE (CFS) =  0.7

TIME (MIN) =  200  DISCHARGE (CFS) =  0.7

TIME (MIN) =  205  DISCHARGE (CFS) =  0.8

TIME (MIN) =  210  DISCHARGE (CFS) =  0.9

TIME (MIN) =  215  DISCHARGE (CFS) =  1

TIME (MIN) =  220  DISCHARGE (CFS) =  1.1
```

TIME (MIN) = 225 DISCHARGE (CFS) = 1.3

TIME (MIN) = 230 DISCHARGE (CFS) = 1.5

TIME (MIN) = 235 DISCHARGE (CFS) = 2.2

TIME (MIN) = 240 DISCHARGE (CFS) = 3

TIME (MIN) = 245 DISCHARGE (CFS) = 11.43

TIME (MIN) = 250 DISCHARGE (CFS) = 1.8

TIME (MIN) = 255 DISCHARGE (CFS) = 1.2

TIME (MIN) = 260 DISCHARGE (CFS) = 0.9

TIME (MIN) = 265 DISCHARGE (CFS) = 0.8

TIME (MIN) = 270 DISCHARGE (CFS) = 0.7

TIME (MIN) = 275 DISCHARGE (CFS) = 0.6

TIME (MIN) = 280 DISCHARGE (CFS) = 0.6

TIME (MIN) = 285 DISCHARGE (CFS) = 0.5

TIME (MIN) = 290 DISCHARGE (CFS) = 0.5

TIME (MIN) = 295 DISCHARGE (CFS) = 0.4

TIME (MIN) = 300 DISCHARGE (CFS) = 0.4

TIME (MIN) = 305 DISCHARGE (CFS) = 0.4

TIME (MIN) = 310 DISCHARGE (CFS) = 0.4

TIME (MIN) = 315 DISCHARGE (CFS) = 0.4

TIME (MIN) = 320 DISCHARGE (CFS) = 0.3

TIME (MIN) = 325 DISCHARGE (CFS) = 0.3

TIME (MIN) = 330 DISCHARGE (CFS) = 0.3

TIME (MIN) = 335 DISCHARGE (CFS) = 0.3

TIME (MIN) = 340 DISCHARGE (CFS) = 0.3

TIME (MIN) = 345 DISCHARGE (CFS) = 0.3

TIME (MIN) = 350 DISCHARGE (CFS) = 0.3

TIME (MIN) = 355 DISCHARGE (CFS) = 0.3

TIME (MIN) = 360 DISCHARGE (CFS) = 0.3

TIME (MIN) = 365 DISCHARGE (CFS) = 0

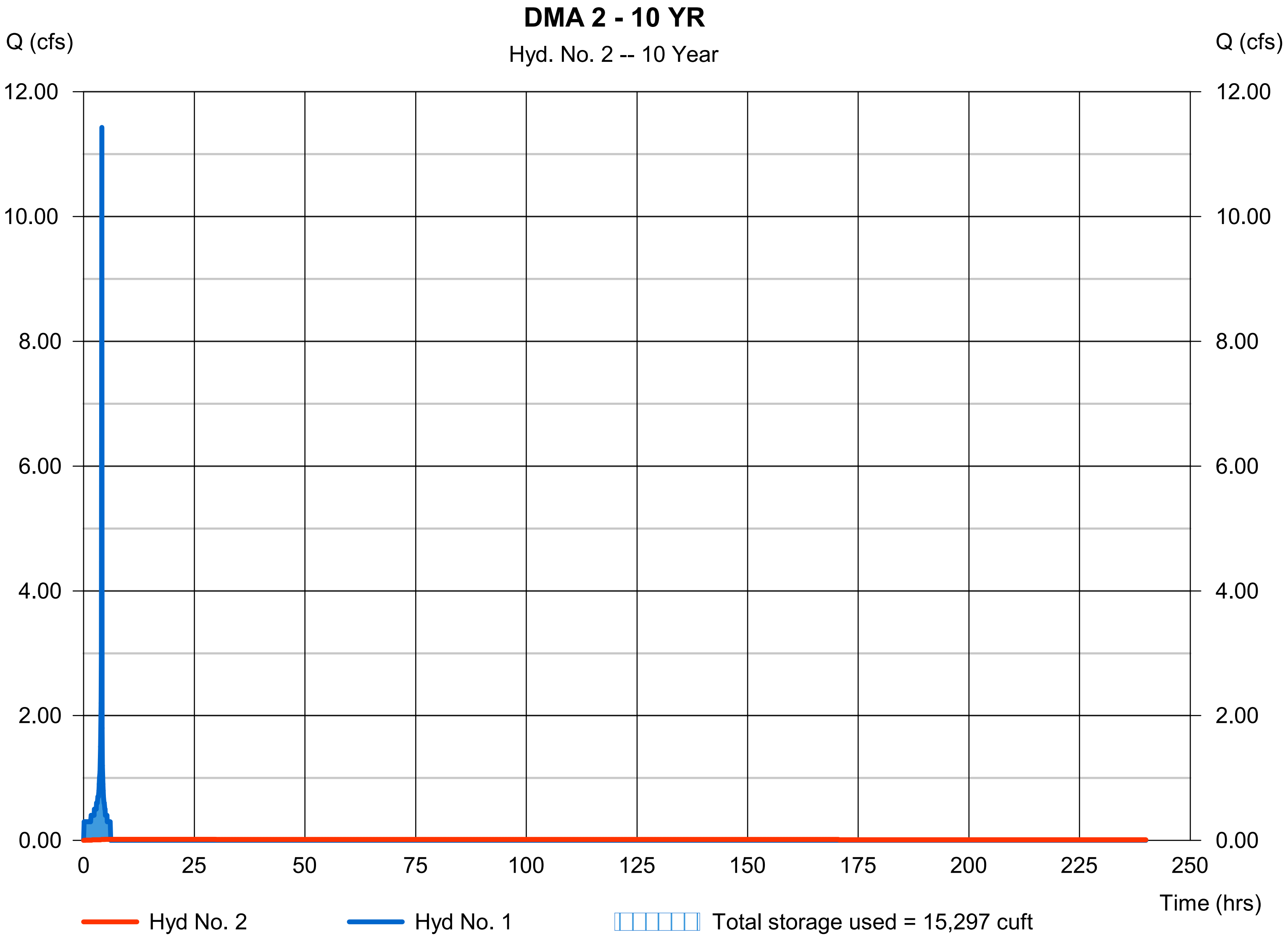
Hydrograph Report

Hyd. No. 2

DMA 2 - 10 YR

Hydrograph type	= Reservoir	Peak discharge	= 0.017 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 11,188 cuft
Inflow hyd. No.	= 1 - DMA 2 - 10 Year	Max. Elevation	= 402.64 ft
Reservoir name	= DMA 2	Max. Storage	= 15,297 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DMA 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 399.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	399.00	4,420	0	0
1.00	400.00	4,420	4,199	4,199
2.00	401.00	4,420	4,199	8,397
3.00	402.00	4,420	4,199	12,596
4.00	403.00	4,420	4,199	16,794
5.00	404.00	4,420	4,199	20,993

Culvert / Orifice Structures

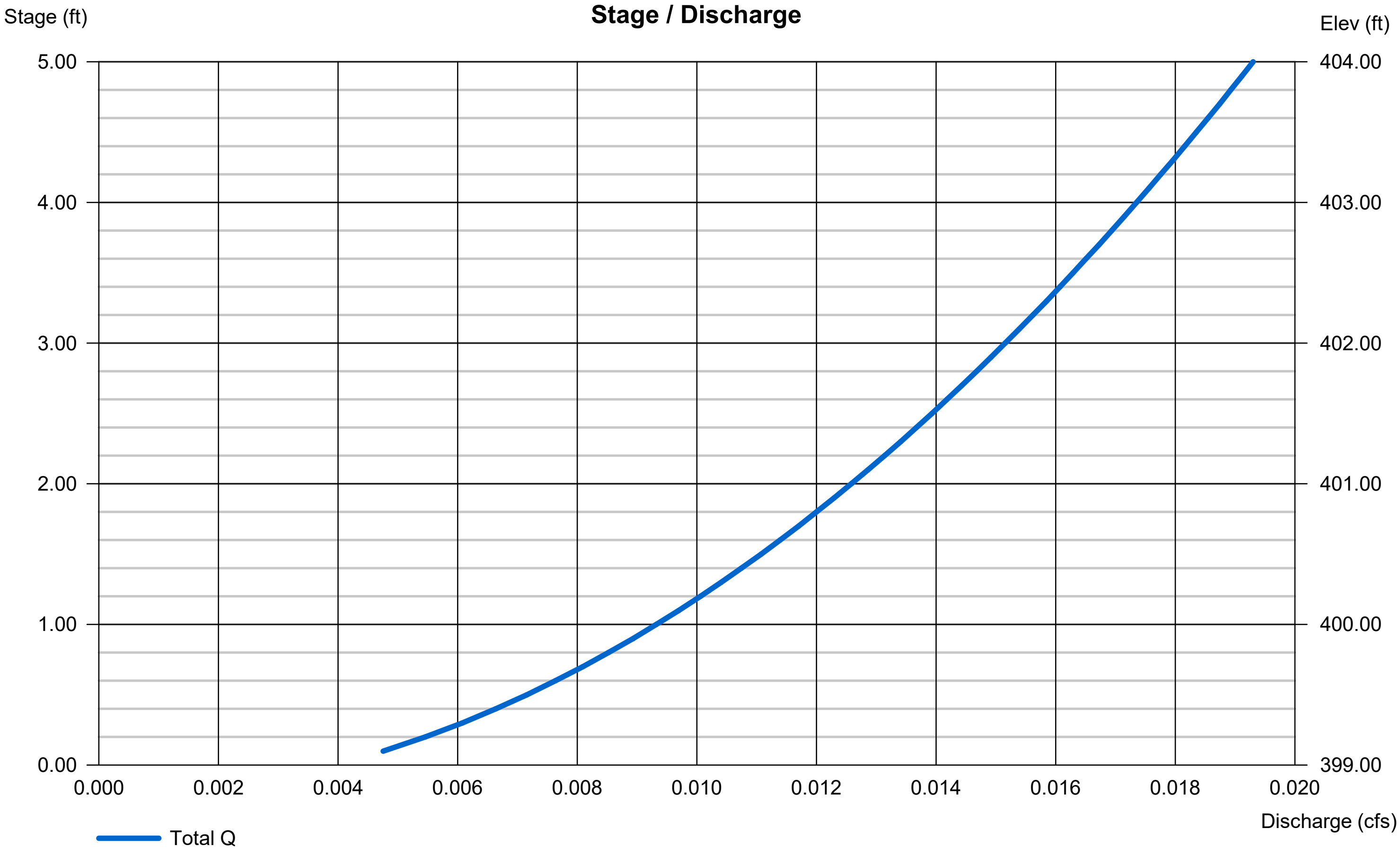
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 1.00	0.00	0.00	0.00
Span (in)	= 1.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 399.00	0.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



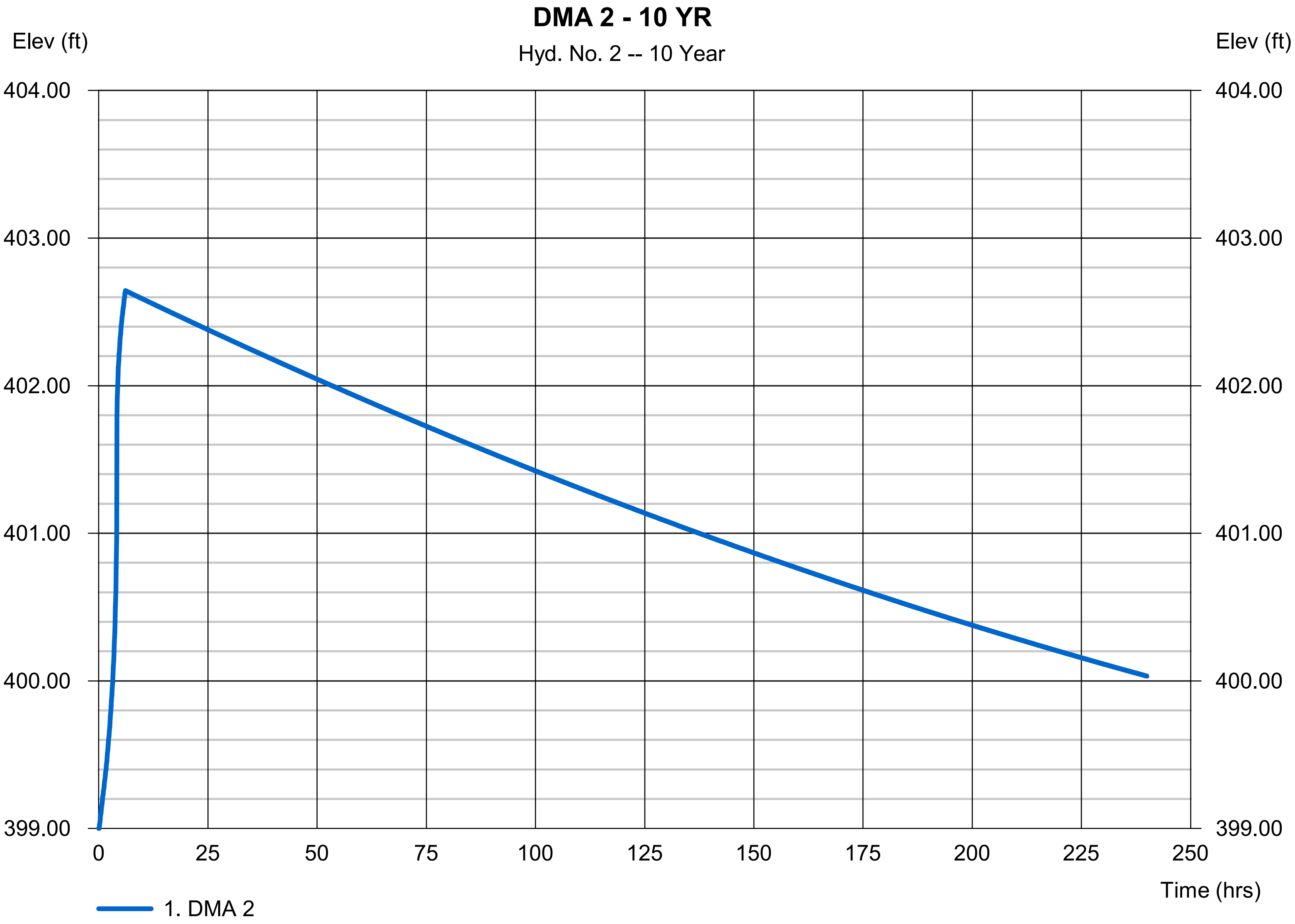
Hydrograph Report

Hyd. No. 2

DMA 2 - 10 YR

Hydrograph type	= Reservoir	Peak discharge	= 0.017 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.08 hrs
Time interval	= 5 min	Hyd. volume	= 11,188 cuft
Inflow hyd. No.	= 1 - DMA 2 - 10 Year	Max. Elevation	= 402.64 ft
Reservoir name	= DMA 2	Max. Storage	= 15,297 cuft

Storage Indication method used.



DMA 2

100 Year

```
RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/11/2016
TIME OF CONCENTRATION  5  MIN.
6 HOUR RAINFALL  3  INCHES
BASIN AREA  3.26  ACRES
RUNOFF COEFFICIENT  0.69
PEAK DISCHARGE  18.05  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  5  DISCHARGE (CFS) =  0.4
TIME (MIN) =  10  DISCHARGE (CFS) =  0.4
TIME (MIN) =  15  DISCHARGE (CFS) =  0.4
TIME (MIN) =  20  DISCHARGE (CFS) =  0.4
TIME (MIN) =  25  DISCHARGE (CFS) =  0.4
TIME (MIN) =  30  DISCHARGE (CFS) =  0.4
TIME (MIN) =  35  DISCHARGE (CFS) =  0.4
TIME (MIN) =  40  DISCHARGE (CFS) =  0.4
TIME (MIN) =  45  DISCHARGE (CFS) =  0.5
TIME (MIN) =  50  DISCHARGE (CFS) =  0.5
TIME (MIN) =  55  DISCHARGE (CFS) =  0.5
TIME (MIN) =  60  DISCHARGE (CFS) =  0.5
TIME (MIN) =  65  DISCHARGE (CFS) =  0.5
TIME (MIN) =  70  DISCHARGE (CFS) =  0.5
TIME (MIN) =  75  DISCHARGE (CFS) =  0.5
TIME (MIN) =  80  DISCHARGE (CFS) =  0.5
```

```
TIME (MIN) =  85  DISCHARGE (CFS) =  0.5

TIME (MIN) =  90  DISCHARGE (CFS) =  0.5

TIME (MIN) =  95  DISCHARGE (CFS) =  0.5

TIME (MIN) =  100  DISCHARGE (CFS) =  0.6

TIME (MIN) =  105  DISCHARGE (CFS) =  0.6

TIME (MIN) =  110  DISCHARGE (CFS) =  0.6

TIME (MIN) =  115  DISCHARGE (CFS) =  0.6

TIME (MIN) =  120  DISCHARGE (CFS) =  0.6

TIME (MIN) =  125  DISCHARGE (CFS) =  0.6

TIME (MIN) =  130  DISCHARGE (CFS) =  0.6

TIME (MIN) =  135  DISCHARGE (CFS) =  0.7

TIME (MIN) =  140  DISCHARGE (CFS) =  0.7

TIME (MIN) =  145  DISCHARGE (CFS) =  0.7

TIME (MIN) =  150  DISCHARGE (CFS) =  0.7

TIME (MIN) =  155  DISCHARGE (CFS) =  0.8

TIME (MIN) =  160  DISCHARGE (CFS) =  0.8

TIME (MIN) =  165  DISCHARGE (CFS) =  0.8

TIME (MIN) =  170  DISCHARGE (CFS) =  0.8

TIME (MIN) =  175  DISCHARGE (CFS) =  0.9

TIME (MIN) =  180  DISCHARGE (CFS) =  0.9

TIME (MIN) =  185  DISCHARGE (CFS) =  1

TIME (MIN) =  190  DISCHARGE (CFS) =  1

TIME (MIN) =  195  DISCHARGE (CFS) =  1.1

TIME (MIN) =  200  DISCHARGE (CFS) =  1.2

TIME (MIN) =  205  DISCHARGE (CFS) =  1.3

TIME (MIN) =  210  DISCHARGE (CFS) =  1.4

TIME (MIN) =  215  DISCHARGE (CFS) =  1.6

TIME (MIN) =  220  DISCHARGE (CFS) =  1.7

TIME (MIN) =  225  DISCHARGE (CFS) =  2.1
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TIME (MIN) = 230 DISCHARGE (CFS) = 2.4

TIME (MIN) = 235 DISCHARGE (CFS) = 3.5

TIME (MIN) = 240 DISCHARGE (CFS) = 4.7

TIME (MIN) = 245 DISCHARGE (CFS) = 18.05

TIME (MIN) = 250 DISCHARGE (CFS) = 2.8

TIME (MIN) = 255 DISCHARGE (CFS) = 1.9

TIME (MIN) = 260 DISCHARGE (CFS) = 1.5

TIME (MIN) = 265 DISCHARGE (CFS) = 1.2

TIME (MIN) = 270 DISCHARGE (CFS) = 1.1

TIME (MIN) = 275 DISCHARGE (CFS) = 1

TIME (MIN) = 280 DISCHARGE (CFS) = 0.9

TIME (MIN) = 285 DISCHARGE (CFS) = 0.8

TIME (MIN) = 290 DISCHARGE (CFS) = 0.7

TIME (MIN) = 295 DISCHARGE (CFS) = 0.7

TIME (MIN) = 300 DISCHARGE (CFS) = 0.7

TIME (MIN) = 305 DISCHARGE (CFS) = 0.6

TIME (MIN) = 310 DISCHARGE (CFS) = 0.6

TIME (MIN) = 315 DISCHARGE (CFS) = 0.6

TIME (MIN) = 320 DISCHARGE (CFS) = 0.5

TIME (MIN) = 325 DISCHARGE (CFS) = 0.5

TIME (MIN) = 330 DISCHARGE (CFS) = 0.5

TIME (MIN) = 335 DISCHARGE (CFS) = 0.5

TIME (MIN) = 340 DISCHARGE (CFS) = 0.5

TIME (MIN) = 345 DISCHARGE (CFS) = 0.4

TIME (MIN) = 350 DISCHARGE (CFS) = 0.4

TIME (MIN) = 355 DISCHARGE (CFS) = 0.4

TIME (MIN) = 360 DISCHARGE (CFS) = 0.4

TIME (MIN) = 365 DISCHARGE (CFS) = 0

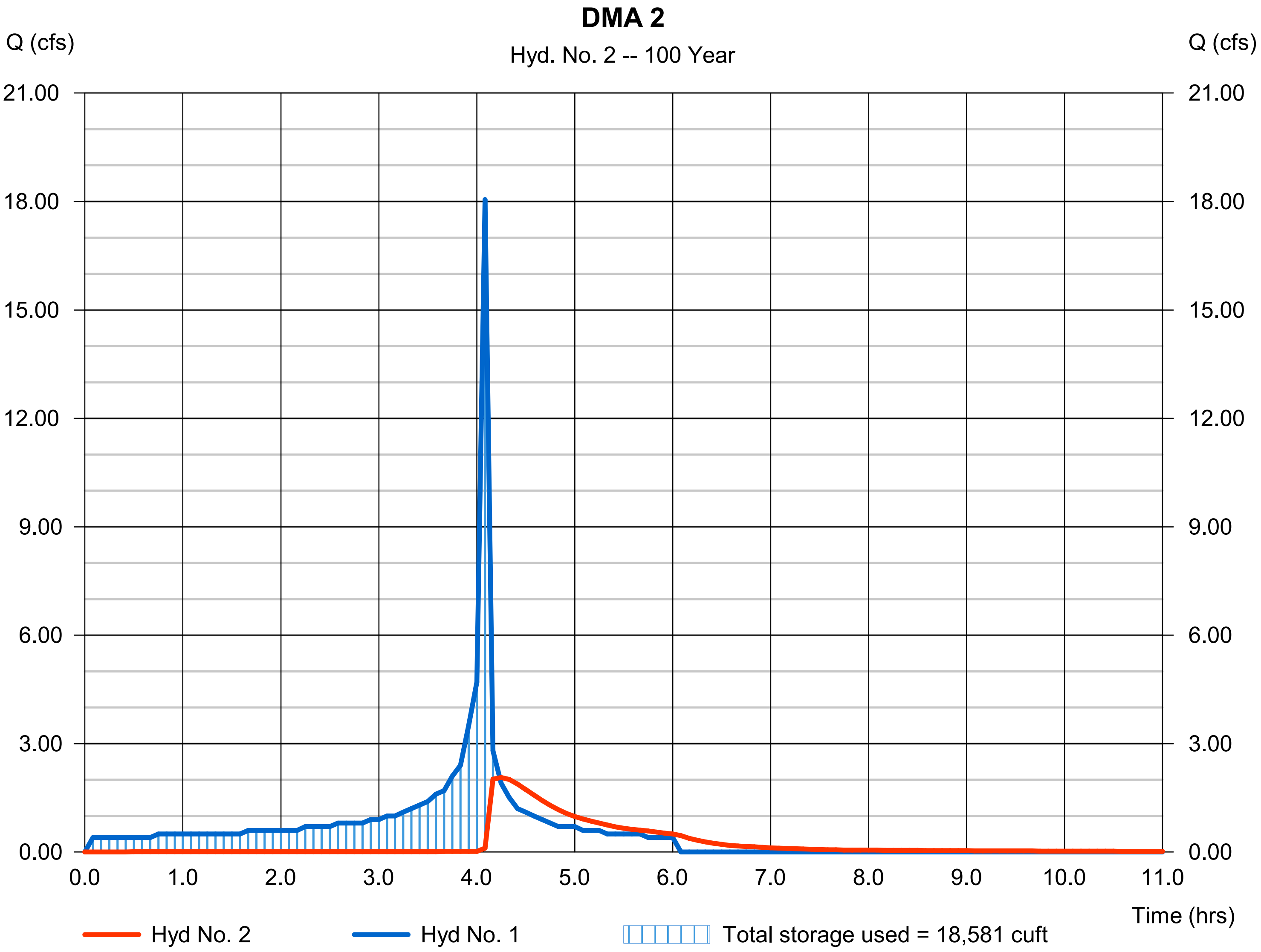
Hydrograph Report

Hyd. No. 2

DMA 2

Hydrograph type	= Reservoir	Peak discharge	= 2.059 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.25 hrs
Time interval	= 5 min	Hyd. volume	= 19,890 cuft
Inflow hyd. No.	= 1 - DMA 2	Max. Elevation	= 403.43 ft
Reservoir name	= DMA 2	Max. Storage	= 18,581 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Monday, 10 / 17 / 2016

Pond No. 1 - DMA 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 399.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	399.00	4,420	0	0
1.00	400.00	4,420	4,199	4,199
2.00	401.00	4,420	4,199	8,397
3.00	402.00	4,420	4,199	12,596
4.00	403.00	4,420	4,199	16,794
5.00	404.00	4,420	4,199	20,993
6.00	405.00	4,420	4,199	25,191
7.00	406.00	4,420	4,199	29,390
8.00	407.00	4,420	4,199	33,589

Culvert / Orifice Structures

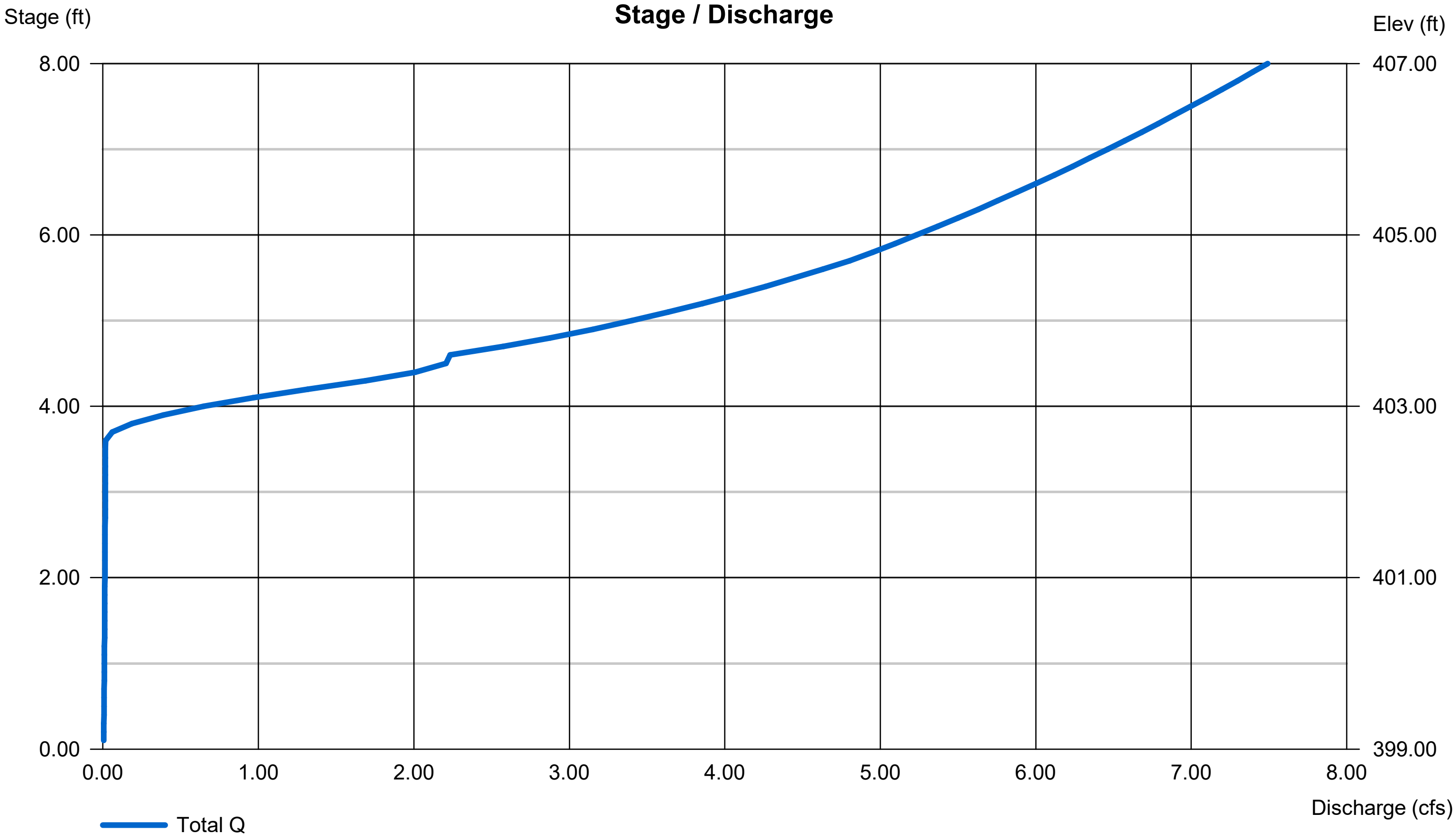
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 1.00	12.00	0.00	0.00
Span (in)	= 1.00	12.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 399.00	402.60	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

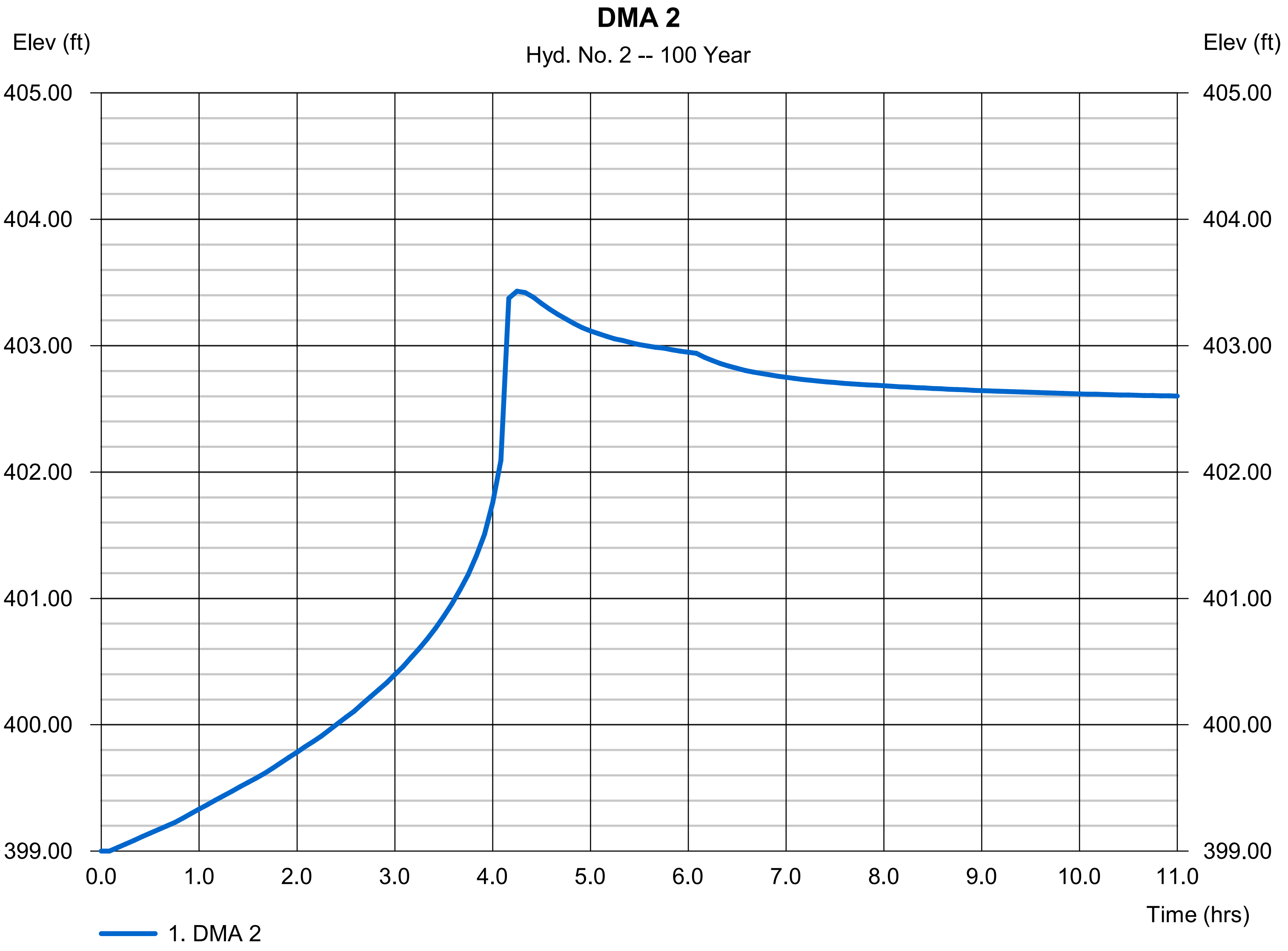
Hyd. No. 2

DMA 2

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 5 min
Inflow hyd. No. = 1 - DMA 2
Reservoir name = DMA 2

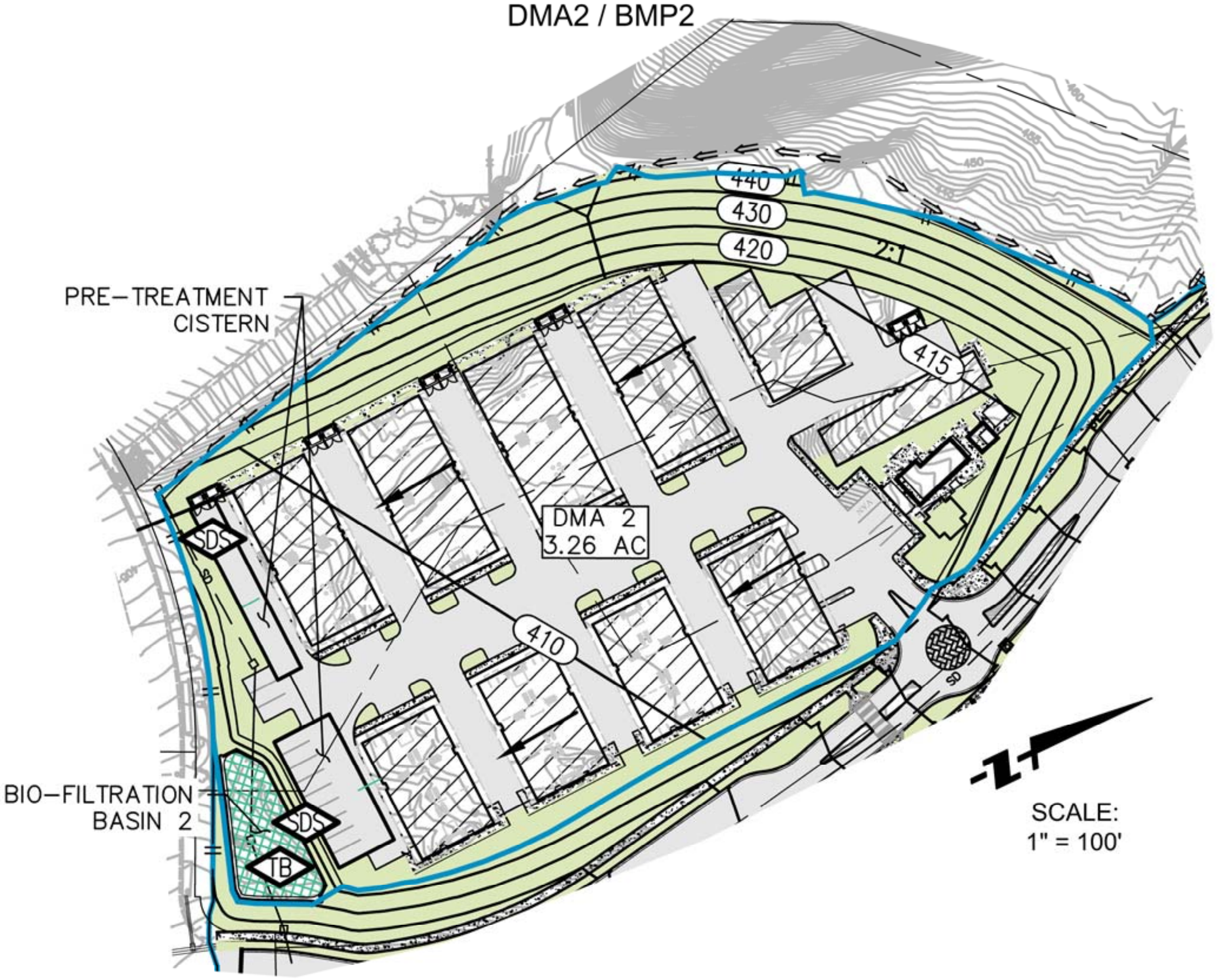
Peak discharge = 2.059 cfs
Time to peak = 4.25 hrs
Hyd. volume = 19,890 cuft
Max. Elevation = 403.43 ft
Max. Storage = 18,581 cuft

Storage Indication method used.



STRUCTURAL BMP DMA MAPBOOK

DMA2 / BMP2



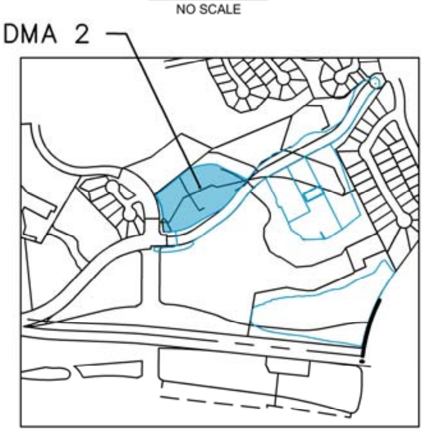
DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
2	2	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	◇SDS
TREATMENT BASIN	◇TB

INDEX MAP
NO SCALE



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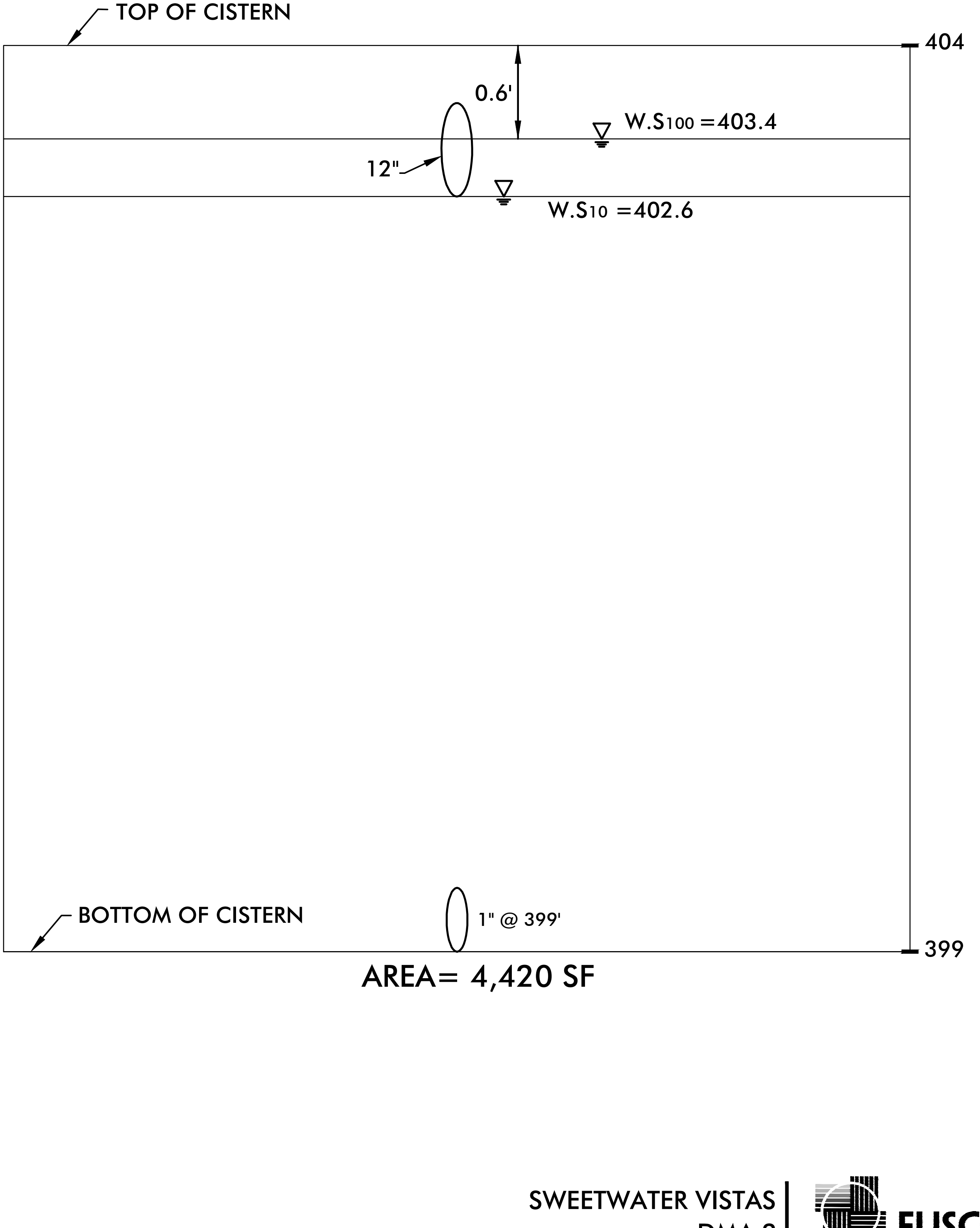
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\SWMP\BMP DMA MAPBOOK\DMA 2.DWG (10-18-2016 9:36:45AM) Plotted by: ESMITH

DMA 2



AREA= 4,420 SF

SWEETWATER VISTAS
DMA 2
DATE: 10/10/16

FUSCOE
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San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

DMA 3

10 YEAR

```
RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/12/2016
TIME OF CONCENTRATION  9  MIN.
6 HOUR RAINFALL  1.9  INCHES
BASIN AREA  5.14  ACRES
RUNOFF COEFFICIENT  0.7
PEAK DISCHARGE  12.15  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  9  DISCHARGE (CFS) =  0.3
TIME (MIN) =  18  DISCHARGE (CFS) =  0.4
TIME (MIN) =  27  DISCHARGE (CFS) =  0.4
TIME (MIN) =  36  DISCHARGE (CFS) =  0.4
TIME (MIN) =  45  DISCHARGE (CFS) =  0.4
TIME (MIN) =  54  DISCHARGE (CFS) =  0.5
TIME (MIN) =  63  DISCHARGE (CFS) =  0.5
TIME (MIN) =  72  DISCHARGE (CFS) =  0.5
TIME (MIN) =  81  DISCHARGE (CFS) =  0.5
TIME (MIN) =  90  DISCHARGE (CFS) =  0.5
TIME (MIN) =  99  DISCHARGE (CFS) =  0.5
TIME (MIN) =  108  DISCHARGE (CFS) =  0.6
TIME (MIN) =  117  DISCHARGE (CFS) =  0.6
TIME (MIN) =  126  DISCHARGE (CFS) =  0.6
TIME (MIN) =  135  DISCHARGE (CFS) =  0.6
```

TIME (MIN) = 144 DISCHARGE (CFS) = 0.7

TIME (MIN) = 153 DISCHARGE (CFS) = 0.7

TIME (MIN) = 162 DISCHARGE (CFS) = 0.8

TIME (MIN) = 171 DISCHARGE (CFS) = 0.8

TIME (MIN) = 180 DISCHARGE (CFS) = 0.9

TIME (MIN) = 189 DISCHARGE (CFS) = 1

TIME (MIN) = 198 DISCHARGE (CFS) = 1.1

TIME (MIN) = 207 DISCHARGE (CFS) = 1.2

TIME (MIN) = 216 DISCHARGE (CFS) = 1.5

TIME (MIN) = 225 DISCHARGE (CFS) = 1.7

TIME (MIN) = 234 DISCHARGE (CFS) = 2.4

TIME (MIN) = 243 DISCHARGE (CFS) = 3.6

TIME (MIN) = 252 DISCHARGE (CFS) = 12.15

TIME (MIN) = 261 DISCHARGE (CFS) = 2

TIME (MIN) = 270 DISCHARGE (CFS) = 1.3

TIME (MIN) = 279 DISCHARGE (CFS) = 1

TIME (MIN) = 288 DISCHARGE (CFS) = 0.9

TIME (MIN) = 297 DISCHARGE (CFS) = 0.7

TIME (MIN) = 306 DISCHARGE (CFS) = 0.7

TIME (MIN) = 315 DISCHARGE (CFS) = 0.6

TIME (MIN) = 324 DISCHARGE (CFS) = 0.6

TIME (MIN) = 333 DISCHARGE (CFS) = 0.5

TIME (MIN) = 342 DISCHARGE (CFS) = 0.5

TIME (MIN) = 351 DISCHARGE (CFS) = 0.5

TIME (MIN) = 360 DISCHARGE (CFS) = 0.4

TIME (MIN) = 369 DISCHARGE (CFS) = 0

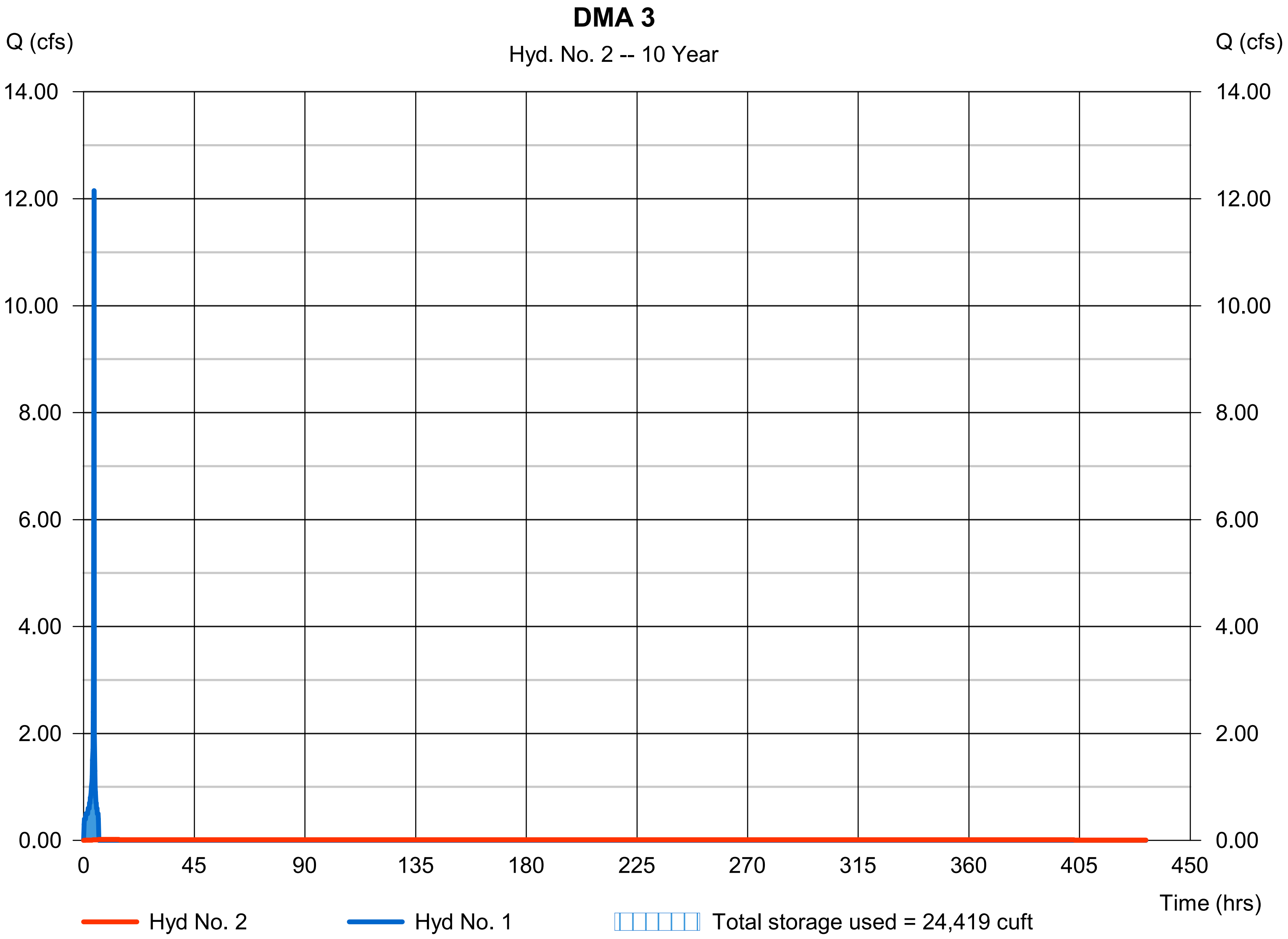
Hydrograph Report

Hyd. No. 2

DMA 3

Hydrograph type	= Reservoir	Peak discharge	= 0.014 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.15 hrs
Time interval	= 9 min	Hyd. volume	= 16,802 cuft
Inflow hyd. No.	= 1 - DMA 3	Max. Elevation	= 422.29 ft
Reservoir name	= DMA 3	Max. Storage	= 24,419 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Monday, 10 / 17 / 2016

Pond No. 1 - DMA 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 418.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	418.00	6,000	0	0
1.00	419.00	6,000	5,699	5,699
2.00	420.00	6,000	5,699	11,399
3.00	421.00	6,000	5,699	17,098
4.00	422.00	6,000	5,699	22,798
5.00	423.00	6,000	5,699	28,497
6.00	424.00	6,000	5,699	34,197
6.50	424.50	6,000	2,850	37,046

Culvert / Orifice Structures

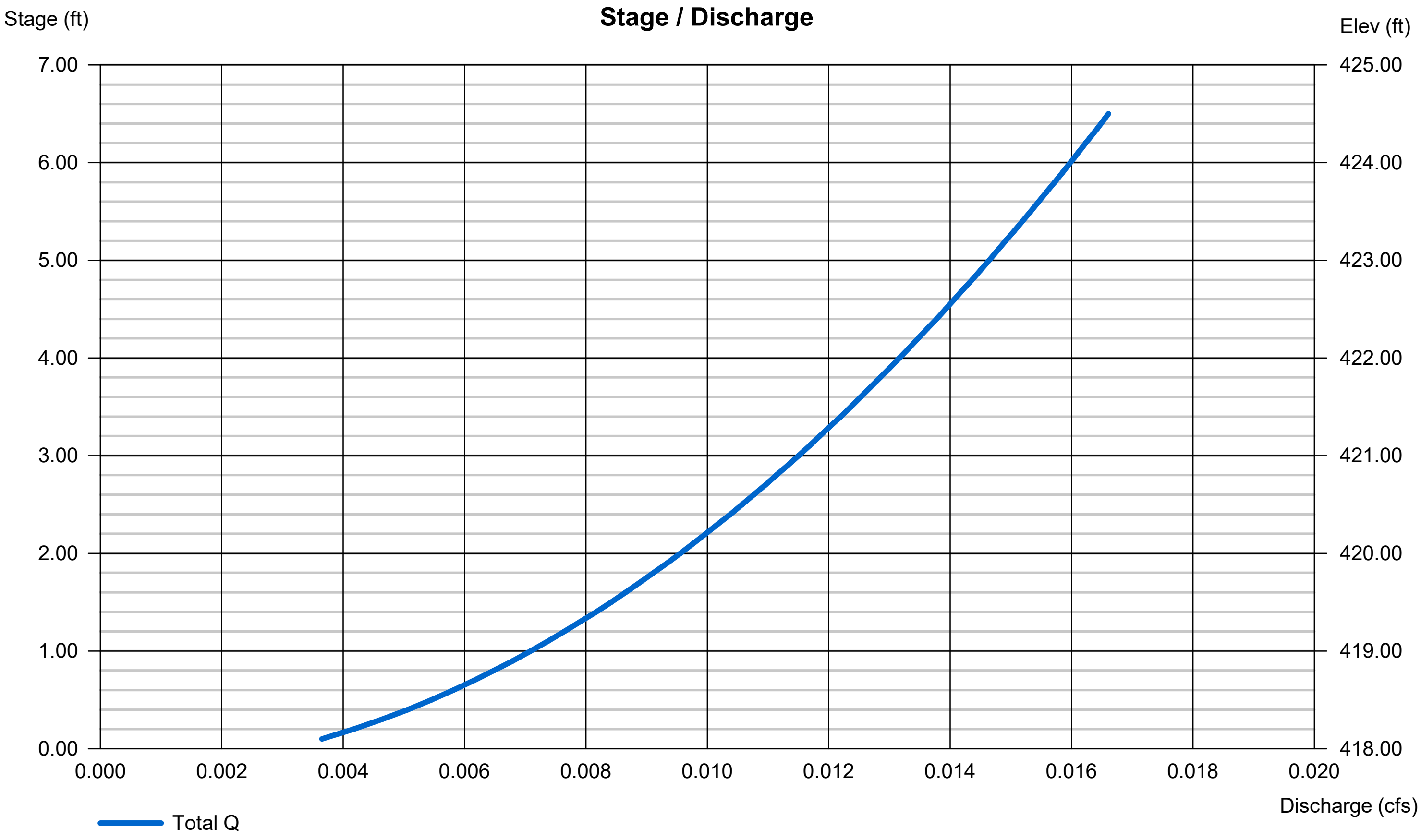
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.90	0.00	0.00	0.00
Span (in)	= 0.90	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 418.00	0.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

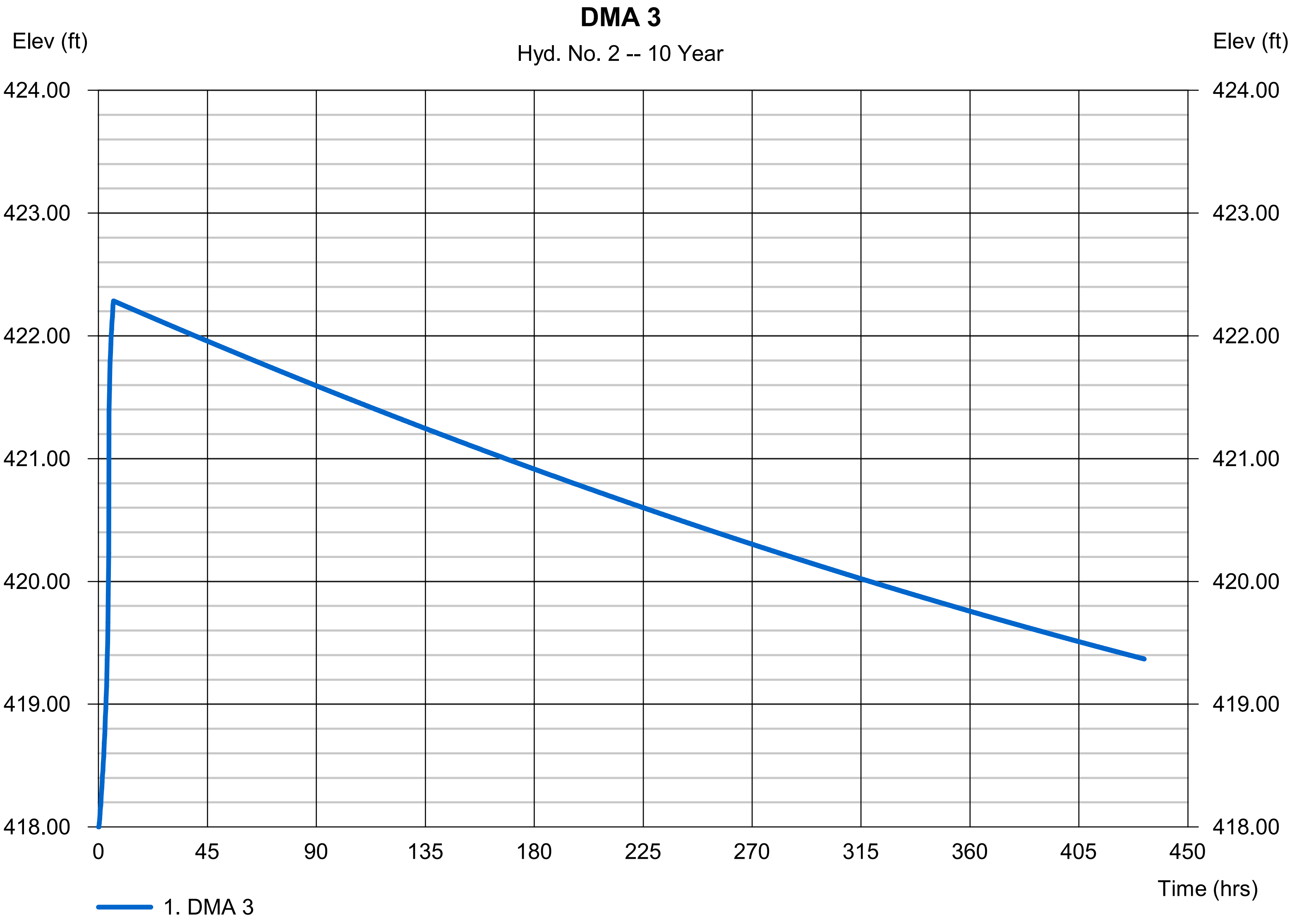
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Monday, 10 / 17 / 2016

Hyd. No. 2

DMA 3

Hydrograph type	= Reservoir	Peak discharge	= 0.014 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.15 hrs
Time interval	= 9 min	Hyd. volume	= 16,802 cuft
Inflow hyd. No.	= 1 - DMA 3	Max. Elevation	= 422.29 ft
Reservoir name	= DMA 3	Max. Storage	= 24,419 cuft

Storage Indication method used.



DMA 3

100 YEAR

```
RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/11/2016
TIME OF CONCENTRATION  9  MIN.
6 HOUR RAINFALL  3  INCHES
BASIN AREA  5.14  ACRES
RUNOFF COEFFICIENT  0.7
PEAK DISCHARGE  20.03  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  9  DISCHARGE (CFS) =  0.4
TIME (MIN) =  18  DISCHARGE (CFS) =  0.7
TIME (MIN) =  27  DISCHARGE (CFS) =  0.7
TIME (MIN) =  36  DISCHARGE (CFS) =  0.7
TIME (MIN) =  45  DISCHARGE (CFS) =  0.7
TIME (MIN) =  54  DISCHARGE (CFS) =  0.7
TIME (MIN) =  63  DISCHARGE (CFS) =  0.7
TIME (MIN) =  72  DISCHARGE (CFS) =  0.8
TIME (MIN) =  81  DISCHARGE (CFS) =  0.8
TIME (MIN) =  90  DISCHARGE (CFS) =  0.8
TIME (MIN) =  99  DISCHARGE (CFS) =  0.9
TIME (MIN) =  108  DISCHARGE (CFS) =  0.9
TIME (MIN) =  117  DISCHARGE (CFS) =  0.9
TIME (MIN) =  126  DISCHARGE (CFS) =  1
TIME (MIN) =  135  DISCHARGE (CFS) =  1
TIME (MIN) =  144  DISCHARGE (CFS) =  1.1
```

TIME (MIN) = 153 DISCHARGE (CFS) = 1.1

TIME (MIN) = 162 DISCHARGE (CFS) = 1.2

TIME (MIN) = 171 DISCHARGE (CFS) = 1.3

TIME (MIN) = 180 DISCHARGE (CFS) = 1.4

TIME (MIN) = 189 DISCHARGE (CFS) = 1.5

TIME (MIN) = 198 DISCHARGE (CFS) = 1.7

TIME (MIN) = 207 DISCHARGE (CFS) = 1.9

TIME (MIN) = 216 DISCHARGE (CFS) = 2.3

TIME (MIN) = 225 DISCHARGE (CFS) = 2.6

TIME (MIN) = 234 DISCHARGE (CFS) = 3.9

TIME (MIN) = 243 DISCHARGE (CFS) = 4.9

TIME (MIN) = 252 DISCHARGE (CFS) = 20.03

TIME (MIN) = 261 DISCHARGE (CFS) = 3.1

TIME (MIN) = 270 DISCHARGE (CFS) = 2.1

TIME (MIN) = 279 DISCHARGE (CFS) = 1.6

TIME (MIN) = 288 DISCHARGE (CFS) = 1.4

TIME (MIN) = 297 DISCHARGE (CFS) = 1.2

TIME (MIN) = 306 DISCHARGE (CFS) = 1.1

TIME (MIN) = 315 DISCHARGE (CFS) = 1

TIME (MIN) = 324 DISCHARGE (CFS) = 0.9

TIME (MIN) = 333 DISCHARGE (CFS) = 0.8

TIME (MIN) = 342 DISCHARGE (CFS) = 0.8

TIME (MIN) = 351 DISCHARGE (CFS) = 0.7

TIME (MIN) = 360 DISCHARGE (CFS) = 0.7

TIME (MIN) = 369 DISCHARGE (CFS) = 0

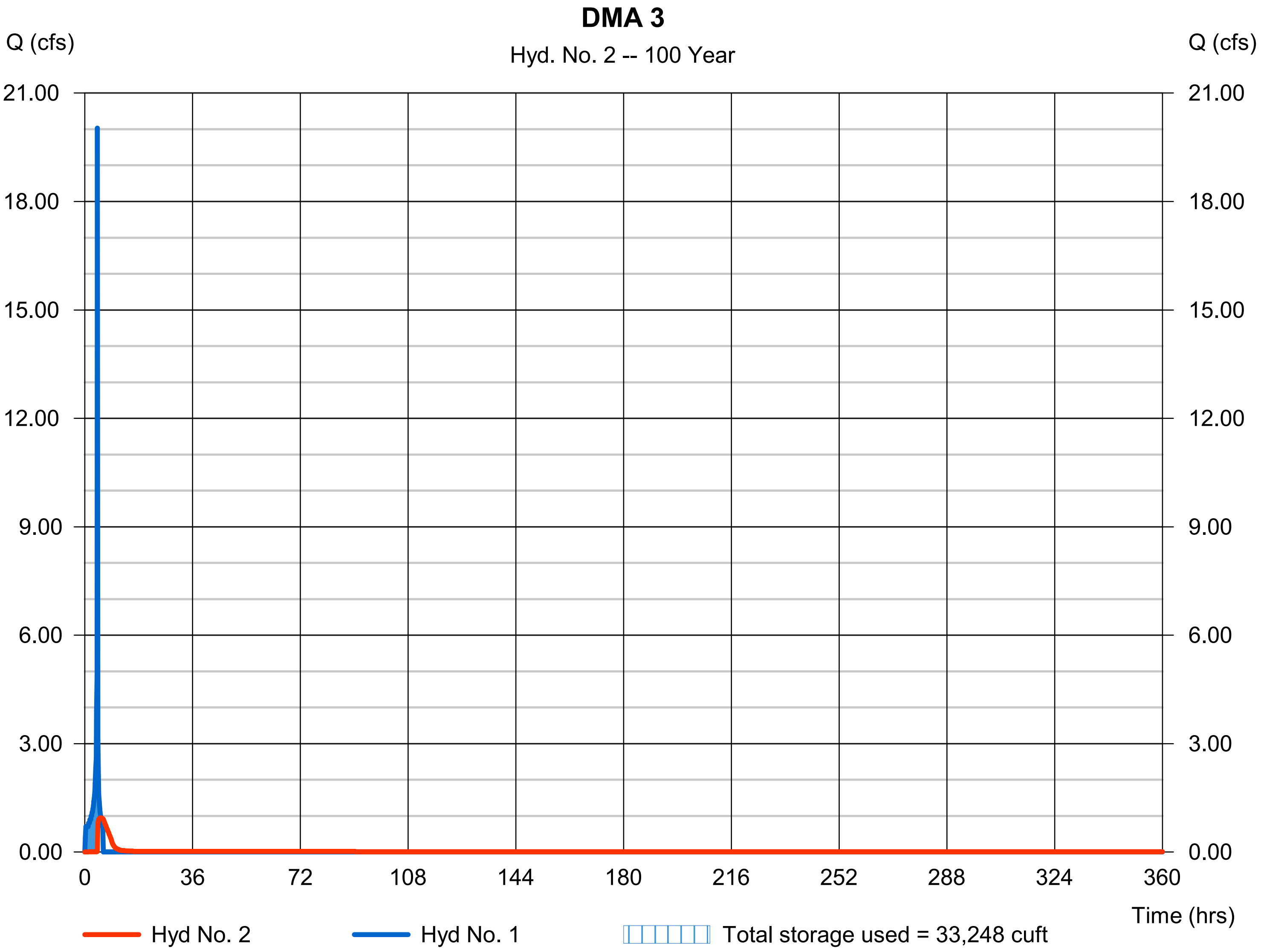
Hydrograph Report

Hyd. No. 2

DMA 3

Hydrograph type	= Reservoir	Peak discharge	= 0.944 cfs
Storm frequency	= 100 yrs	Time to peak	= 5.40 hrs
Time interval	= 9 min	Hyd. volume	= 30,693 cuft
Inflow hyd. No.	= 1 - DMA 3	Max. Elevation	= 423.84 ft
Reservoir name	= DMA 3	Max. Storage	= 33,248 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DMA 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 418.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	418.00	6,000	0	0
1.00	419.00	6,000	5,699	5,699
2.00	420.00	6,000	5,699	11,399
3.00	421.00	6,000	5,699	17,098
4.00	422.00	6,000	5,699	22,798
5.00	423.00	6,000	5,699	28,497
6.00	424.00	6,000	5,699	34,197
6.50	424.50	6,000	2,850	37,046

Culvert / Orifice Structures

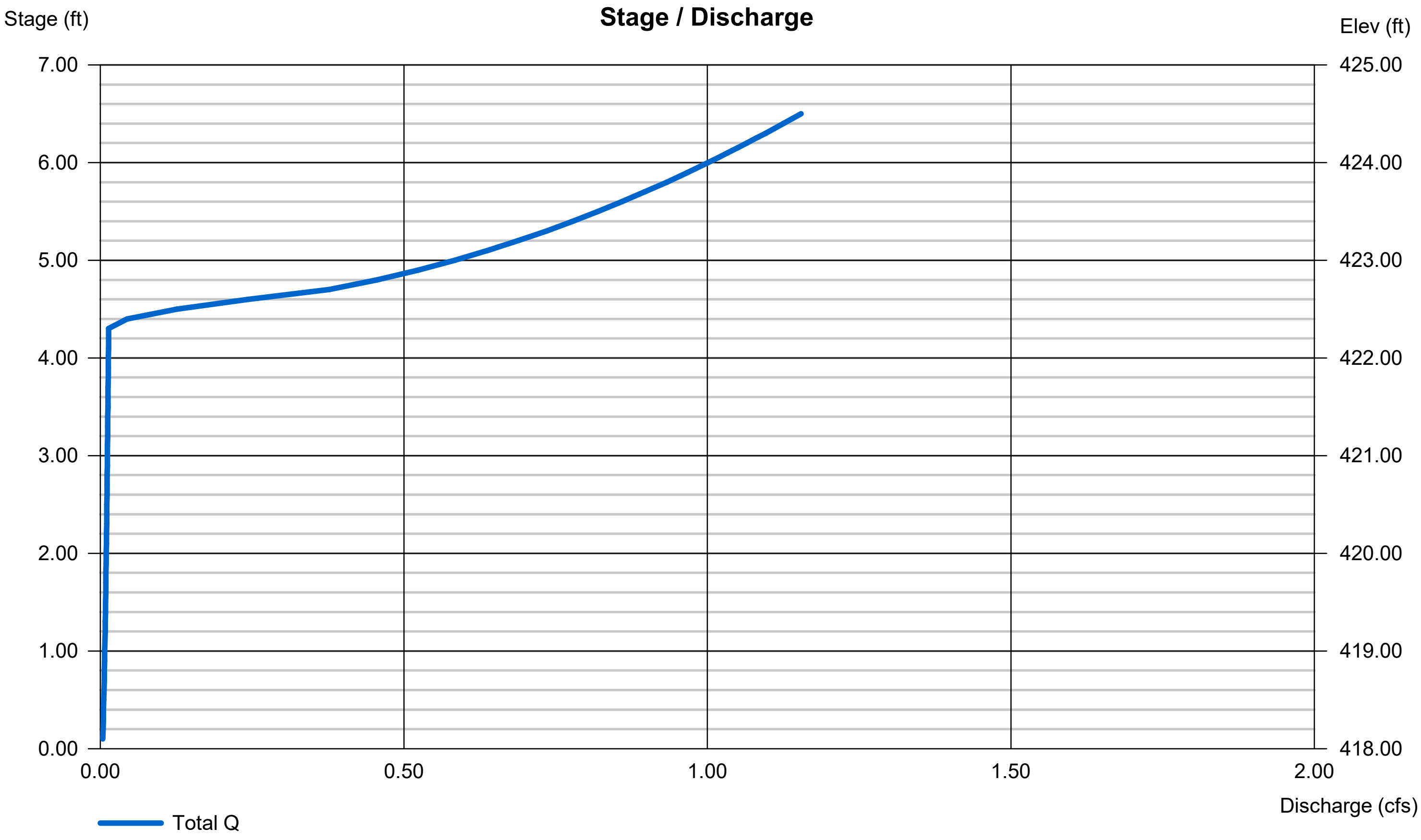
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.90	6.00	0.00	0.00
Span (in)	= 0.90	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 418.00	422.30	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



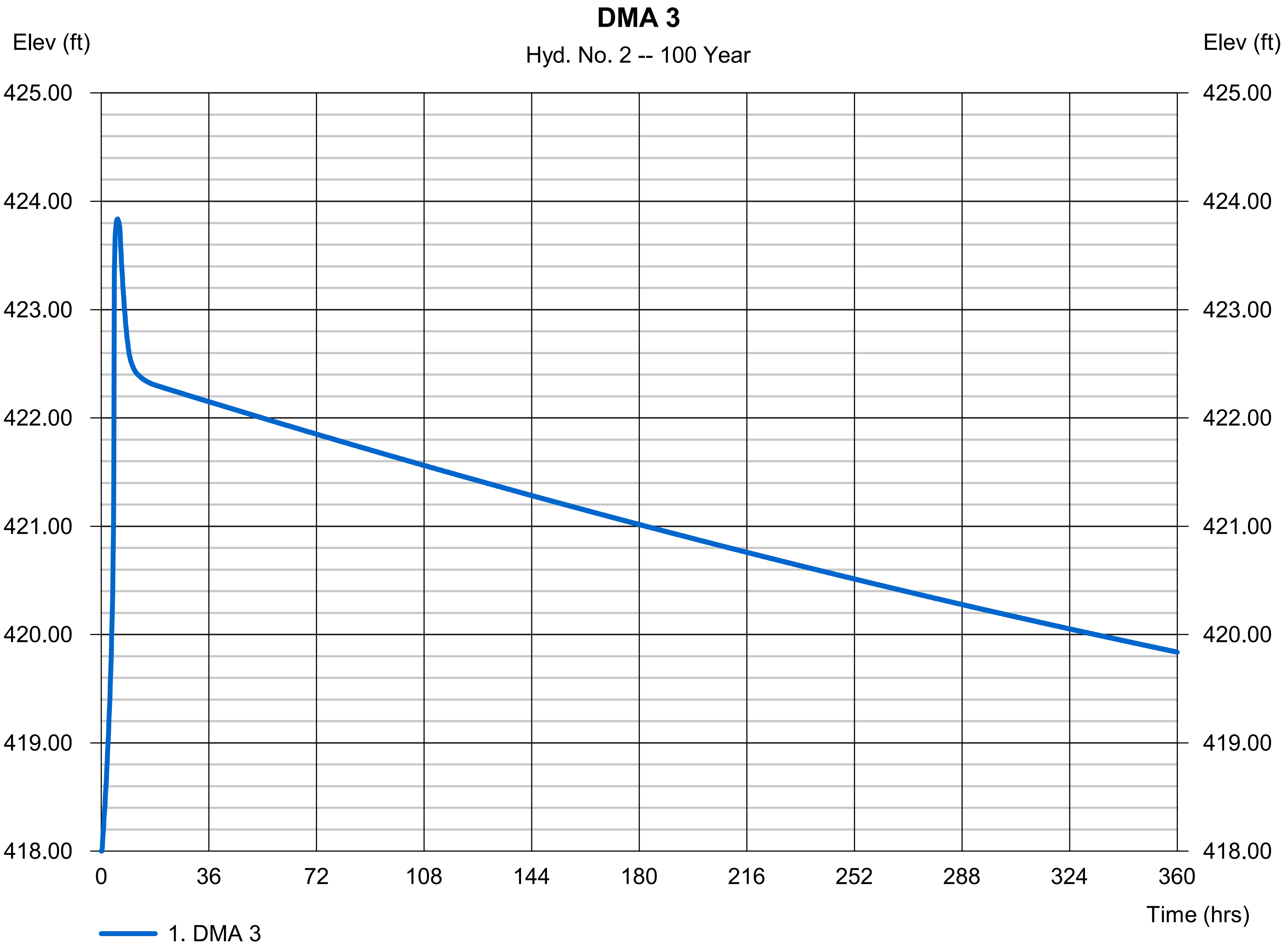
Hydrograph Report

Hyd. No. 2

DMA 3

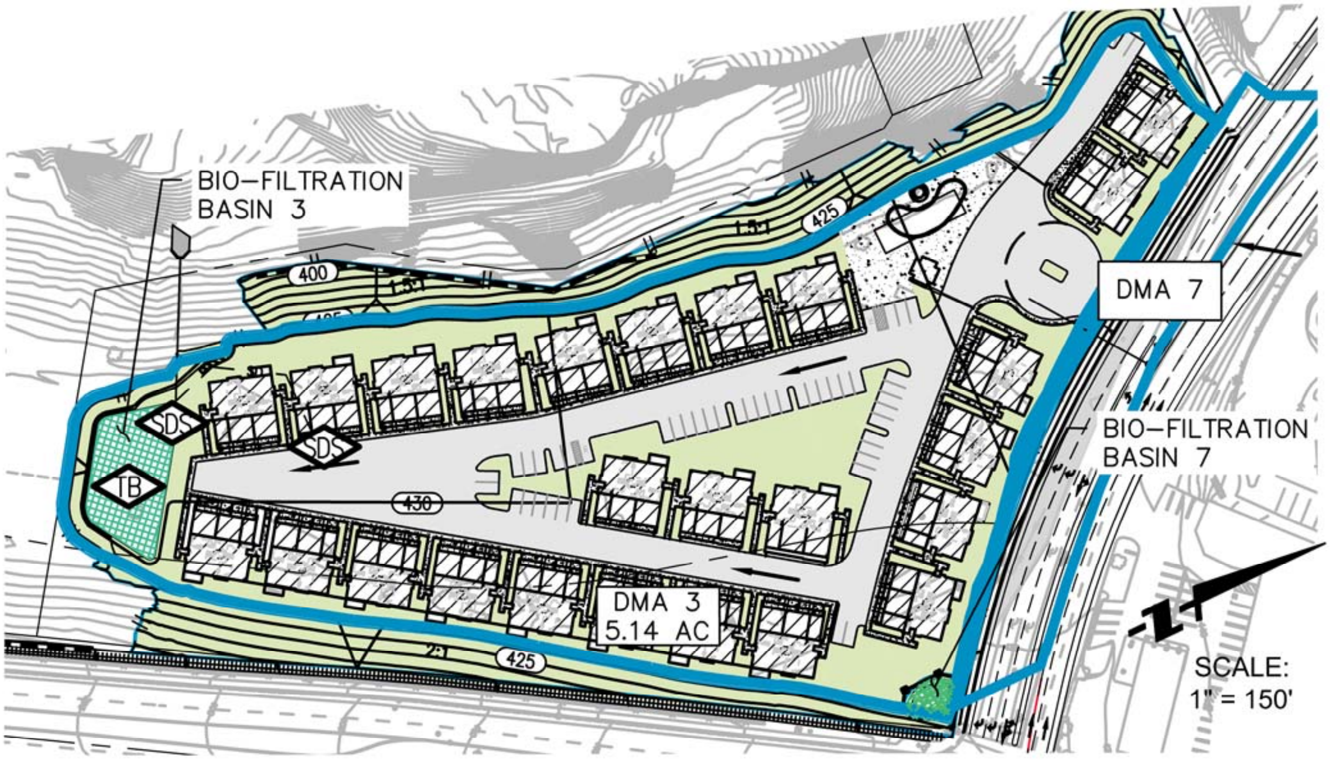
Hydrograph type	= Reservoir	Peak discharge	= 0.944 cfs
Storm frequency	= 100 yrs	Time to peak	= 5.40 hrs
Time interval	= 9 min	Hyd. volume	= 30,693 cuft
Inflow hyd. No.	= 1 - DMA 3	Max. Elevation	= 423.84 ft
Reservoir name	= DMA 3	Max. Storage	= 33,248 cuft

Storage Indication method used.



SWEETWATER VISTAS
STRUCTURAL BMP DMA MAPBOOK

DMA3 & 7 / BMP3 & 7



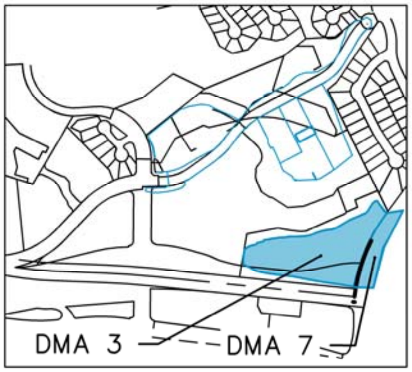
DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
3	3	2-HOA	*BF BASIN + CISTERN	✓	✓
7	7	2-HOA	*BF BASIN	✓	

*BF= BIOFILTRATION BASIN

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━━━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB

INDEX MAP
NO SCALE

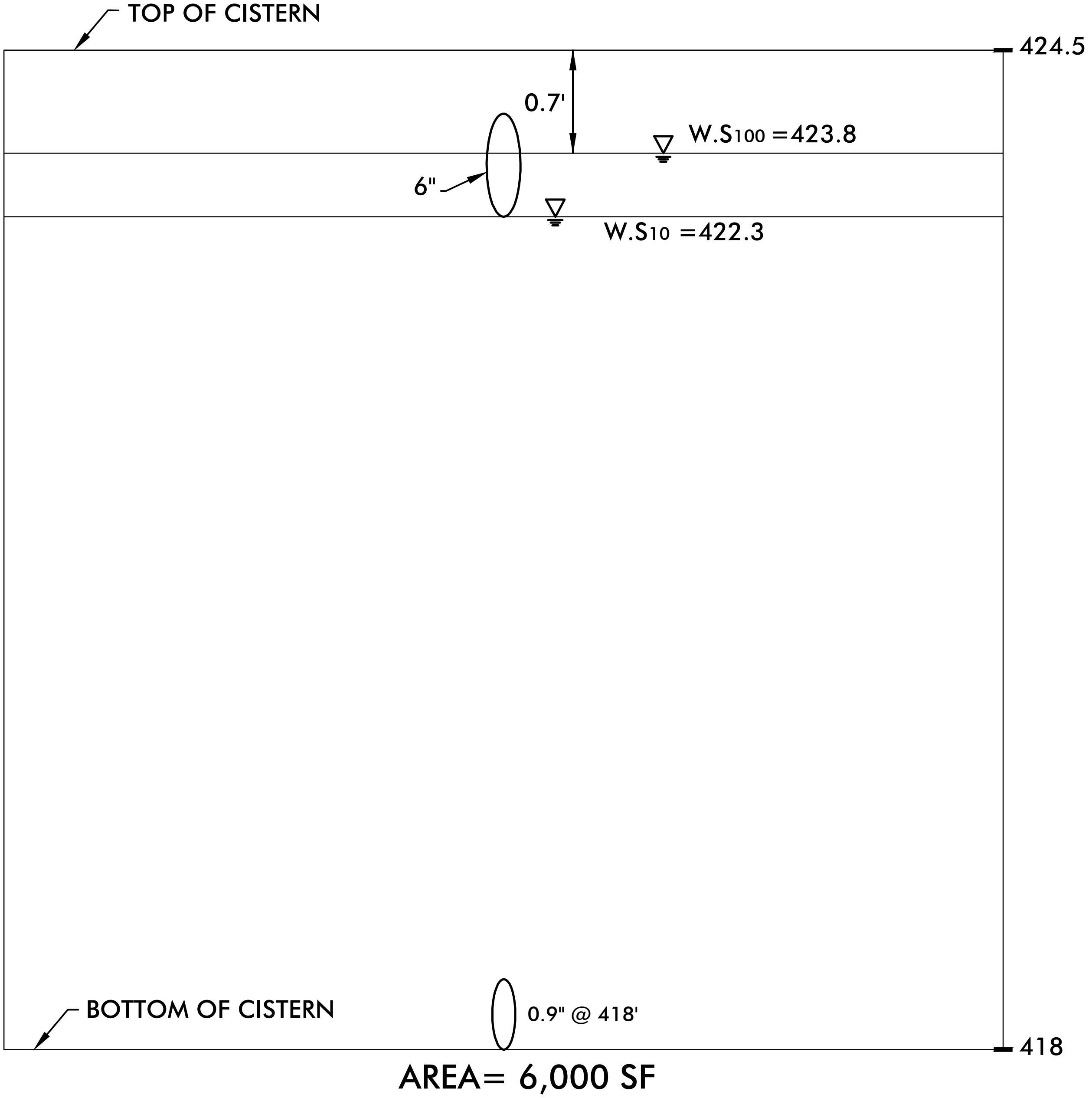


FUSCOE
ENGINEERING

16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\SWMP\BMP DMA MAPBOOK\DMA 3.DWG (10-18-2016 9:58:44AM) Plotted by: ESMITH

DMA 3



AREA= 6,000 SF

SWEETWATER VISTAS
DMA 3
DATE: 10/10/16

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ° fax 858.597.0335
www.fuscoe.com

DMA 4

10 YEAR

```
RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE   8/12/2016
TIME OF CONCENTRATION  7  MIN.
6 HOUR RAINFALL  1.9  INCHES
BASIN AREA  3.4  ACRES
RUNOFF COEFFICIENT  0.81
PEAK DISCHARGE  12.12  CFS

TIME (MIN) =  0  DISCHARGE (CFS) =  0
TIME (MIN) =  7  DISCHARGE (CFS) =  0.3
TIME (MIN) =  14  DISCHARGE (CFS) =  0.3
TIME (MIN) =  21  DISCHARGE (CFS) =  0.3
TIME (MIN) =  28  DISCHARGE (CFS) =  0.3
TIME (MIN) =  35  DISCHARGE (CFS) =  0.3
TIME (MIN) =  42  DISCHARGE (CFS) =  0.3
TIME (MIN) =  49  DISCHARGE (CFS) =  0.4
TIME (MIN) =  56  DISCHARGE (CFS) =  0.4
TIME (MIN) =  63  DISCHARGE (CFS) =  0.4
TIME (MIN) =  70  DISCHARGE (CFS) =  0.4
TIME (MIN) =  77  DISCHARGE (CFS) =  0.4
TIME (MIN) =  84  DISCHARGE (CFS) =  0.4
TIME (MIN) =  91  DISCHARGE (CFS) =  0.4
TIME (MIN) =  98  DISCHARGE (CFS) =  0.4
TIME (MIN) =  105  DISCHARGE (CFS) =  0.4
```

TIME (MIN) = 112 DISCHARGE (CFS) = 0.5

TIME (MIN) = 119 DISCHARGE (CFS) = 0.5

TIME (MIN) = 126 DISCHARGE (CFS) = 0.5

TIME (MIN) = 133 DISCHARGE (CFS) = 0.5

TIME (MIN) = 140 DISCHARGE (CFS) = 0.5

TIME (MIN) = 147 DISCHARGE (CFS) = 0.6

TIME (MIN) = 154 DISCHARGE (CFS) = 0.6

TIME (MIN) = 161 DISCHARGE (CFS) = 0.6

TIME (MIN) = 168 DISCHARGE (CFS) = 0.6

TIME (MIN) = 175 DISCHARGE (CFS) = 0.7

TIME (MIN) = 182 DISCHARGE (CFS) = 0.7

TIME (MIN) = 189 DISCHARGE (CFS) = 0.8

TIME (MIN) = 196 DISCHARGE (CFS) = 0.9

TIME (MIN) = 203 DISCHARGE (CFS) = 1

TIME (MIN) = 210 DISCHARGE (CFS) = 1.1

TIME (MIN) = 217 DISCHARGE (CFS) = 1.3

TIME (MIN) = 224 DISCHARGE (CFS) = 1.5

TIME (MIN) = 231 DISCHARGE (CFS) = 2.2

TIME (MIN) = 238 DISCHARGE (CFS) = 2.1

TIME (MIN) = 245 DISCHARGE (CFS) = 12.12

TIME (MIN) = 252 DISCHARGE (CFS) = 1.8

TIME (MIN) = 259 DISCHARGE (CFS) = 1.2

TIME (MIN) = 266 DISCHARGE (CFS) = 0.9

TIME (MIN) = 273 DISCHARGE (CFS) = 0.8

TIME (MIN) = 280 DISCHARGE (CFS) = 0.7

TIME (MIN) = 287 DISCHARGE (CFS) = 0.6

TIME (MIN) = 294 DISCHARGE (CFS) = 0.5

TIME (MIN) = 301 DISCHARGE (CFS) = 0.5

TIME (MIN) = 308 DISCHARGE (CFS) = 0.5

```
TIME (MIN) =  315  DISCHARGE (CFS) =  0.4

TIME (MIN) =  322  DISCHARGE (CFS) =  0.4

TIME (MIN) =  329  DISCHARGE (CFS) =  0.4

TIME (MIN) =  336  DISCHARGE (CFS) =  0.4

TIME (MIN) =  343  DISCHARGE (CFS) =  0.4

TIME (MIN) =  350  DISCHARGE (CFS) =  0.3

TIME (MIN) =  357  DISCHARGE (CFS) =  0.3

TIME (MIN) =  364  DISCHARGE (CFS) =  0
```

Hydrograph Report

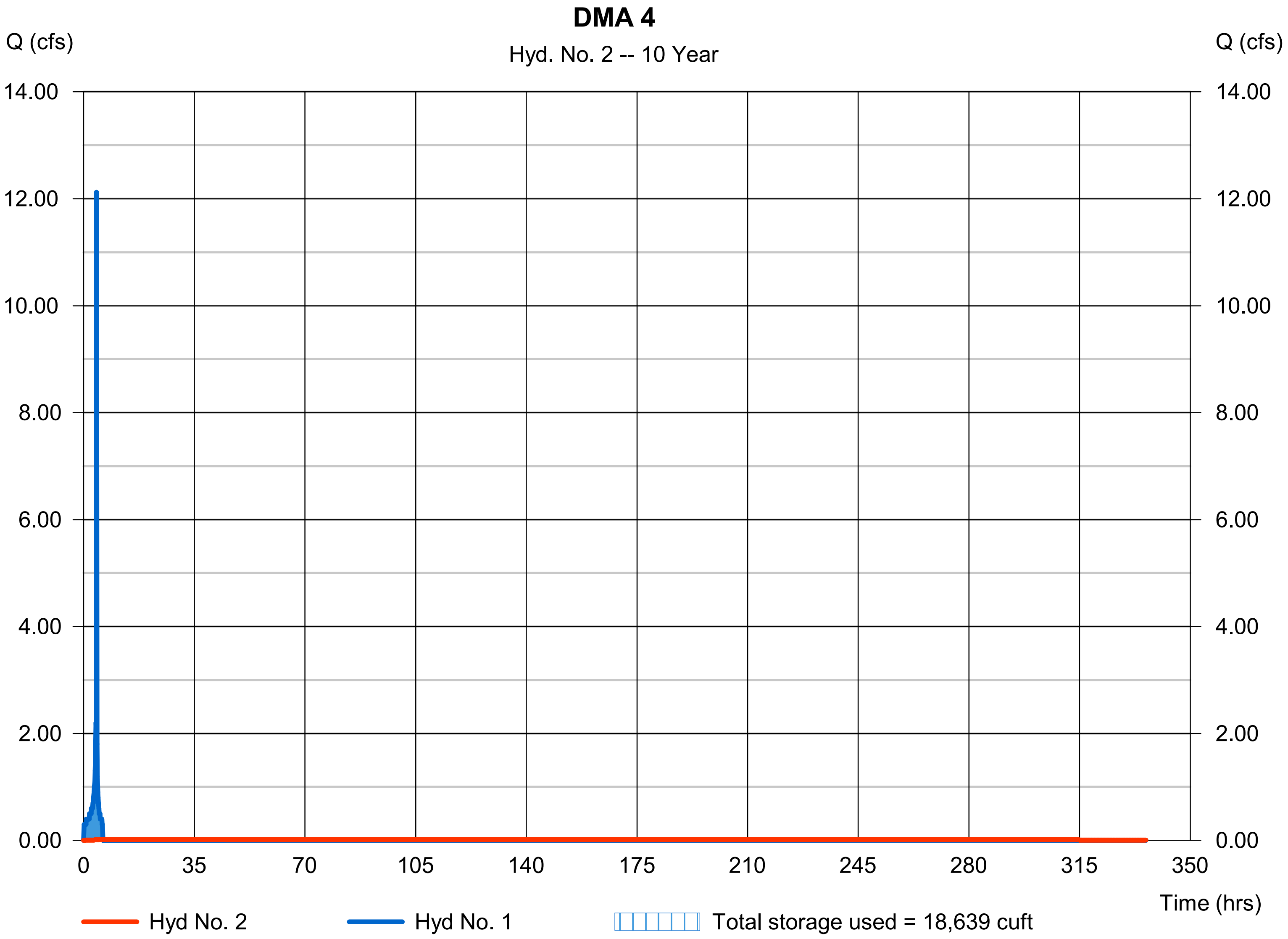
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Monday, 10 / 17 / 2016

Hyd. No. 2

DMA 4

Hydrograph type	=	Reservoir	Peak discharge	=	0.014 cfs
Storm frequency	=	10 yrs	Time to peak	=	6.07 hrs
Time interval	=	7 min	Hyd. volume	=	13,421 cuft
Inflow hyd. No.	=	1 - DMA 4	Max. Elevation	=	369.70 ft
Reservoir name	=	DMA 4	Max. Storage	=	18,639 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DMA 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 365.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	365.00	4,175	0	0
1.00	366.00	4,175	3,966	3,966
2.00	367.00	4,175	3,966	7,932
3.00	368.00	4,175	3,966	11,898
4.00	369.00	4,175	3,966	15,863
5.00	370.00	4,175	3,966	19,829
6.00	371.00	4,175	3,966	23,795
7.00	372.00	4,175	3,966	27,761
7.50	372.50	4,175	1,983	29,744

Culvert / Orifice Structures

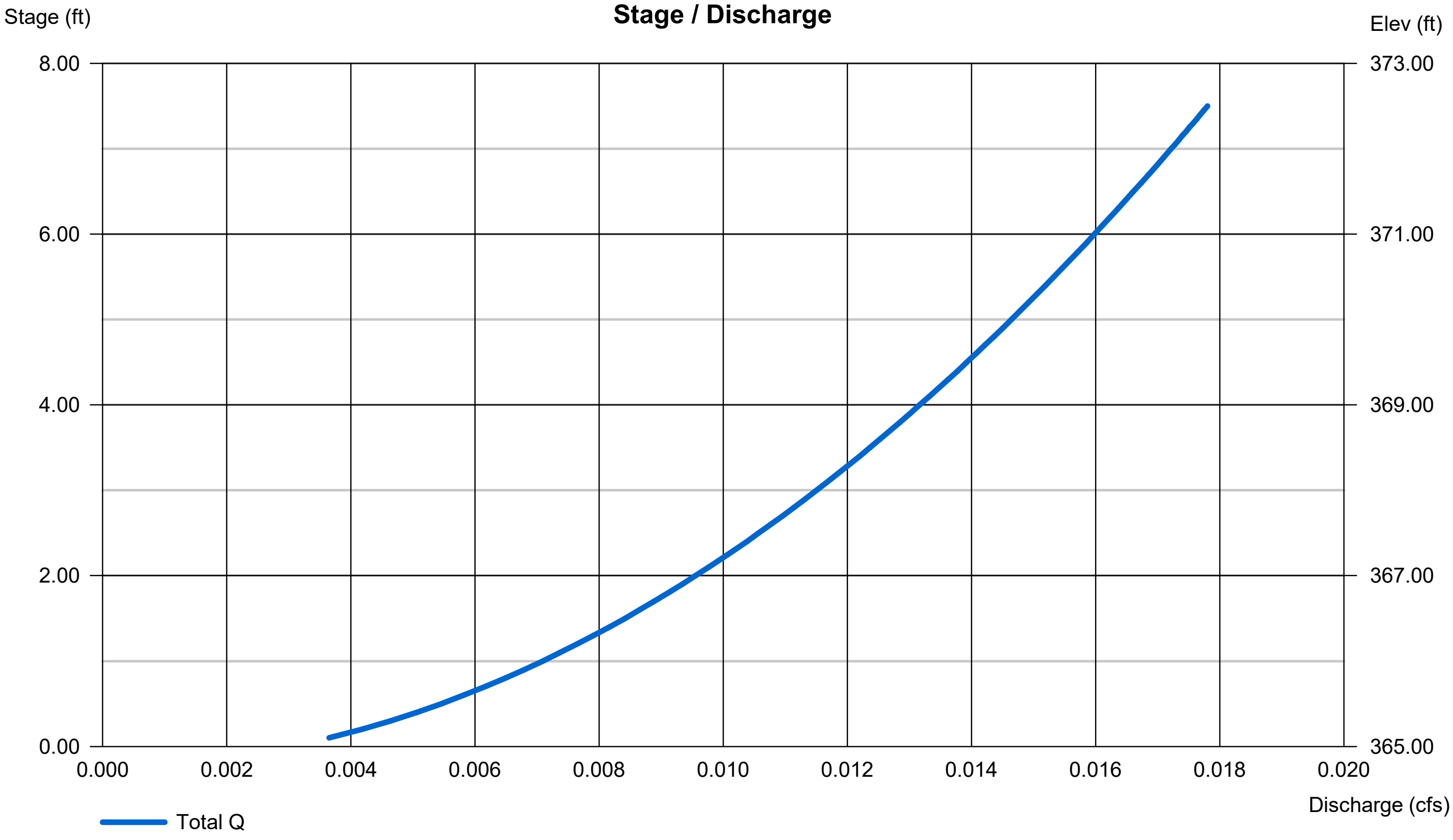
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.90	0.00	0.00	0.00
Span (in)	= 0.90	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 365.00	0.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



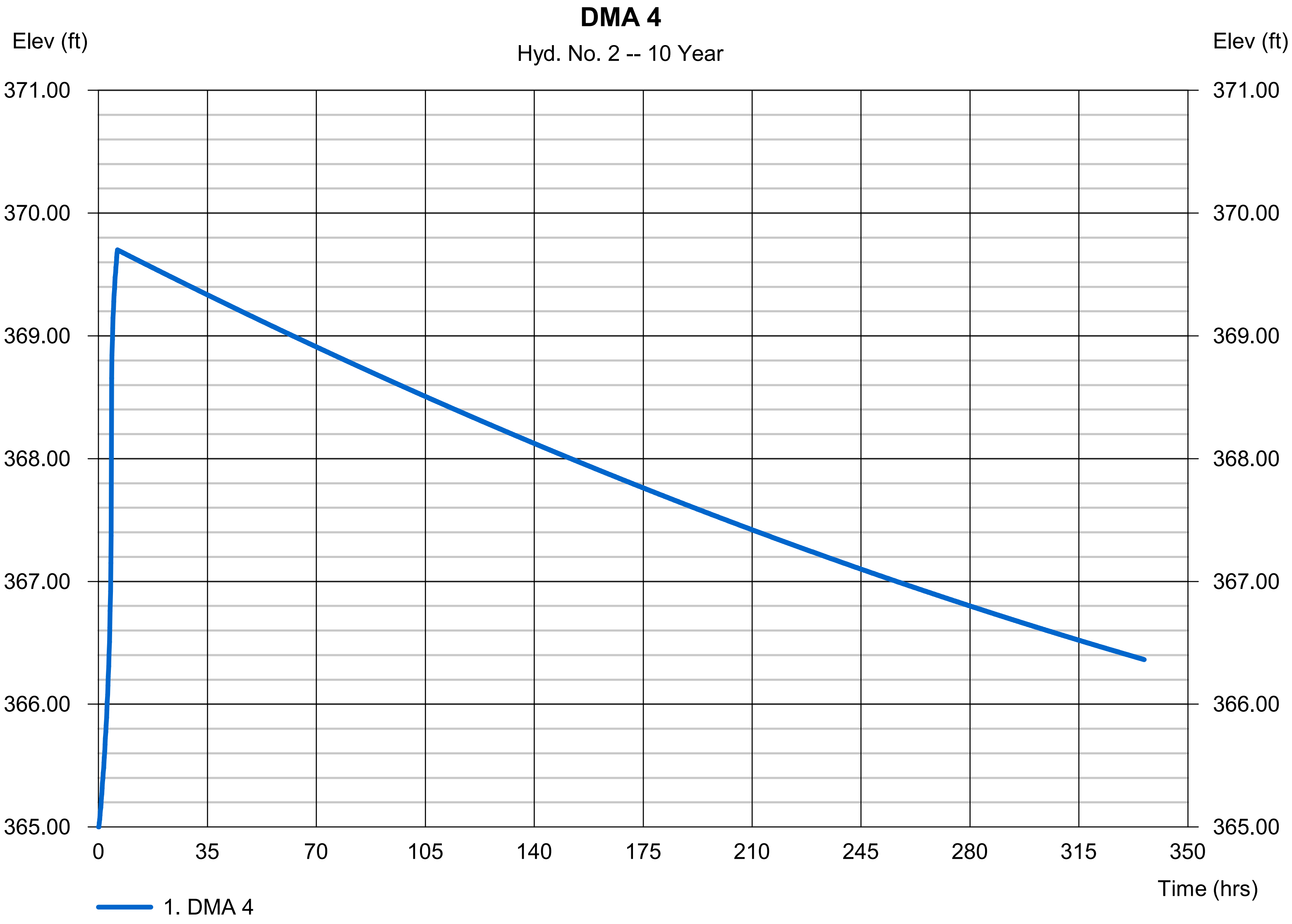
Hydrograph Report

Hyd. No. 2

DMA 4

Hydrograph type	= Reservoir	Peak discharge	= 0.014 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.07 hrs
Time interval	= 7 min	Hyd. volume	= 13,421 cuft
Inflow hyd. No.	= 1 - DMA 4	Max. Elevation	= 369.70 ft
Reservoir name	= DMA 4	Max. Storage	= 18,639 cuft

Storage Indication method used.



DMA 4

100 Year

```
RATIONAL METHOD HYDROGRAPH PROGRAM

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RUN DATE   8/11/2016

TIME OF CONCENTRATION  6  MIN.

6 HOUR RAINFALL  3  INCHES

BASIN AREA  3.61  ACRES

RUNOFF COEFFICIENT  0.81

PEAK DISCHARGE  19.52  CFS


TIME (MIN) =  0  DISCHARGE (CFS) =  0

TIME (MIN) =  6  DISCHARGE (CFS) =  0.5

TIME (MIN) =  12  DISCHARGE (CFS) =  0.5

TIME (MIN) =  18  DISCHARGE (CFS) =  0.5

TIME (MIN) =  24  DISCHARGE (CFS) =  0.5

TIME (MIN) =  30  DISCHARGE (CFS) =  0.6

TIME (MIN) =  36  DISCHARGE (CFS) =  0.6

TIME (MIN) =  42  DISCHARGE (CFS) =  0.6

TIME (MIN) =  48  DISCHARGE (CFS) =  0.6

TIME (MIN) =  54  DISCHARGE (CFS) =  0.6

TIME (MIN) =  60  DISCHARGE (CFS) =  0.6

TIME (MIN) =  66  DISCHARGE (CFS) =  0.6

TIME (MIN) =  72  DISCHARGE (CFS) =  0.6

TIME (MIN) =  78  DISCHARGE (CFS) =  0.7

TIME (MIN) =  84  DISCHARGE (CFS) =  0.7

TIME (MIN) =  90  DISCHARGE (CFS) =  0.7

TIME (MIN) =  96  DISCHARGE (CFS) =  0.7
```

```
TIME (MIN) =  102  DISCHARGE (CFS) =  0.7
TIME (MIN) =  108  DISCHARGE (CFS) =  0.7
TIME (MIN) =  114  DISCHARGE (CFS) =  0.8
TIME (MIN) =  120  DISCHARGE (CFS) =  0.8
TIME (MIN) =  126  DISCHARGE (CFS) =  0.8
TIME (MIN) =  132  DISCHARGE (CFS) =  0.8
TIME (MIN) =  138  DISCHARGE (CFS) =  0.9
TIME (MIN) =  144  DISCHARGE (CFS) =  0.9
TIME (MIN) =  150  DISCHARGE (CFS) =  1
TIME (MIN) =  156  DISCHARGE (CFS) =  1
TIME (MIN) =  162  DISCHARGE (CFS) =  1
TIME (MIN) =  168  DISCHARGE (CFS) =  1.1
TIME (MIN) =  174  DISCHARGE (CFS) =  1.2
TIME (MIN) =  180  DISCHARGE (CFS) =  1.2
TIME (MIN) =  186  DISCHARGE (CFS) =  1.3
TIME (MIN) =  192  DISCHARGE (CFS) =  1.4
TIME (MIN) =  198  DISCHARGE (CFS) =  1.5
TIME (MIN) =  204  DISCHARGE (CFS) =  1.6
TIME (MIN) =  210  DISCHARGE (CFS) =  1.8
TIME (MIN) =  216  DISCHARGE (CFS) =  2
TIME (MIN) =  222  DISCHARGE (CFS) =  2.4
TIME (MIN) =  228  DISCHARGE (CFS) =  2.8
TIME (MIN) =  234  DISCHARGE (CFS) =  4.1
TIME (MIN) =  240  DISCHARGE (CFS) =  6.8
TIME (MIN) =  246  DISCHARGE (CFS) =  19.52
TIME (MIN) =  252  DISCHARGE (CFS) =  3.3
TIME (MIN) =  258  DISCHARGE (CFS) =  2.2
TIME (MIN) =  264  DISCHARGE (CFS) =  1.7
TIME (MIN) =  270  DISCHARGE (CFS) =  1.4
```

```
TIME (MIN) =  276  DISCHARGE (CFS) =  1.2

TIME (MIN) =  282  DISCHARGE (CFS) =  1.1

TIME (MIN) =  288  DISCHARGE (CFS) =  1

TIME (MIN) =  294  DISCHARGE (CFS) =  0.9

TIME (MIN) =  300  DISCHARGE (CFS) =  0.9

TIME (MIN) =  306  DISCHARGE (CFS) =  0.8

TIME (MIN) =  312  DISCHARGE (CFS) =  0.8

TIME (MIN) =  318  DISCHARGE (CFS) =  0.7

TIME (MIN) =  324  DISCHARGE (CFS) =  0.7

TIME (MIN) =  330  DISCHARGE (CFS) =  0.6

TIME (MIN) =  336  DISCHARGE (CFS) =  0.6

TIME (MIN) =  342  DISCHARGE (CFS) =  0.6

TIME (MIN) =  348  DISCHARGE (CFS) =  0.6

TIME (MIN) =  354  DISCHARGE (CFS) =  0.6

TIME (MIN) =  360  DISCHARGE (CFS) =  0.5

TIME (MIN) =  366  DISCHARGE (CFS) =  0
```

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Monday, 10 / 17 / 2016

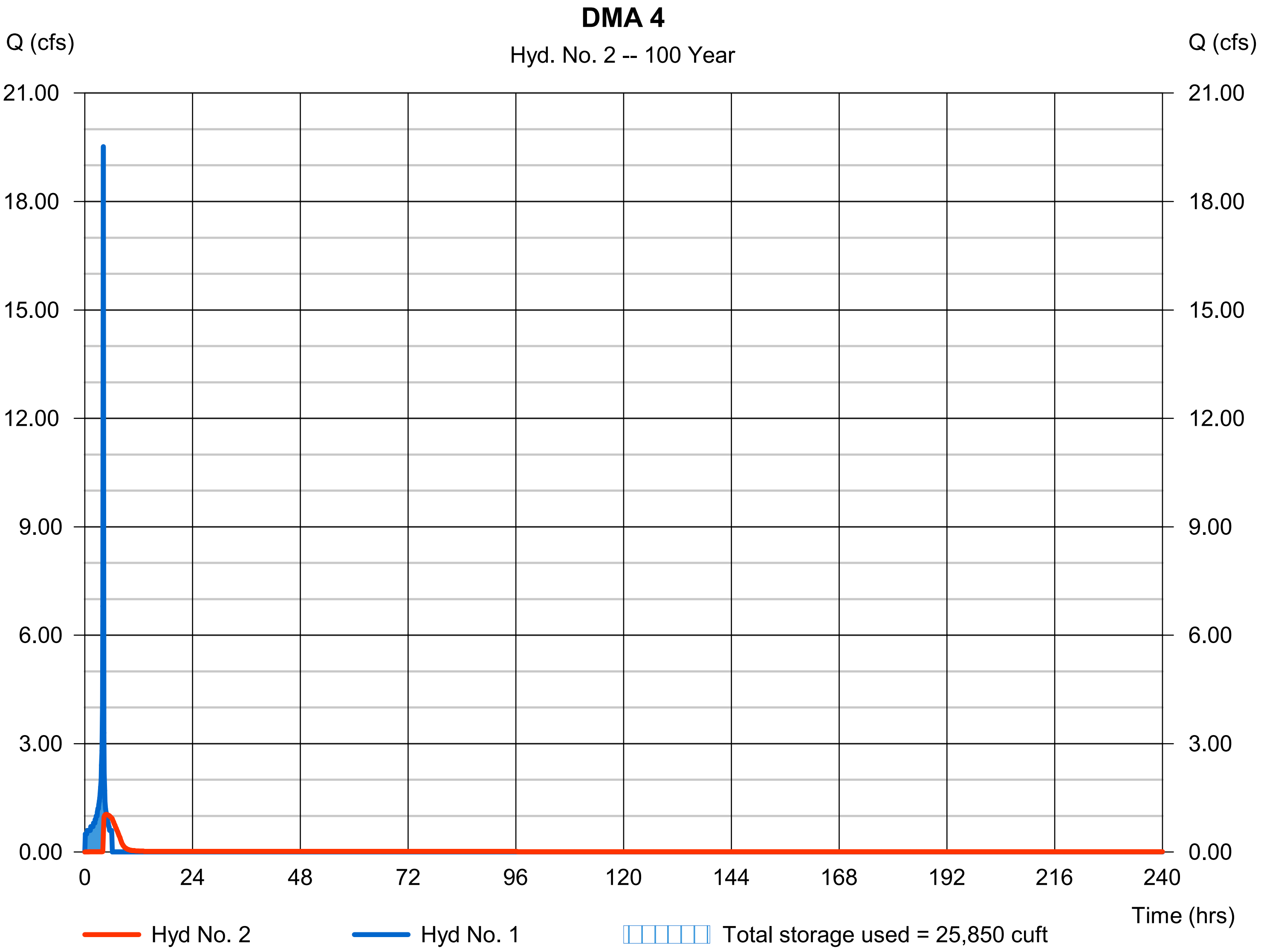
Hyd. No. 2

DMA 4

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 6 min
Inflow hyd. No. = 1 - DMA 4
Reservoir name = DMA 4

Peak discharge = 1.040 cfs
Time to peak = 4.80 hrs
Hyd. volume = 24,504 cuft
Max. Elevation = 371.52 ft
Max. Storage = 25,850 cuft

Storage Indication method used.



Pond No. 1 - DMA 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 365.00 ft. Voids = 95.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	365.00	4,175	0	0
1.00	366.00	4,175	3,966	3,966
2.00	367.00	4,175	3,966	7,932
3.00	368.00	4,175	3,966	11,898
4.00	369.00	4,175	3,966	15,863
5.00	370.00	4,175	3,966	19,829
6.00	371.00	4,175	3,966	23,795
7.00	372.00	4,175	3,966	27,761
7.50	372.50	4,175	1,983	29,744

Culvert / Orifice Structures

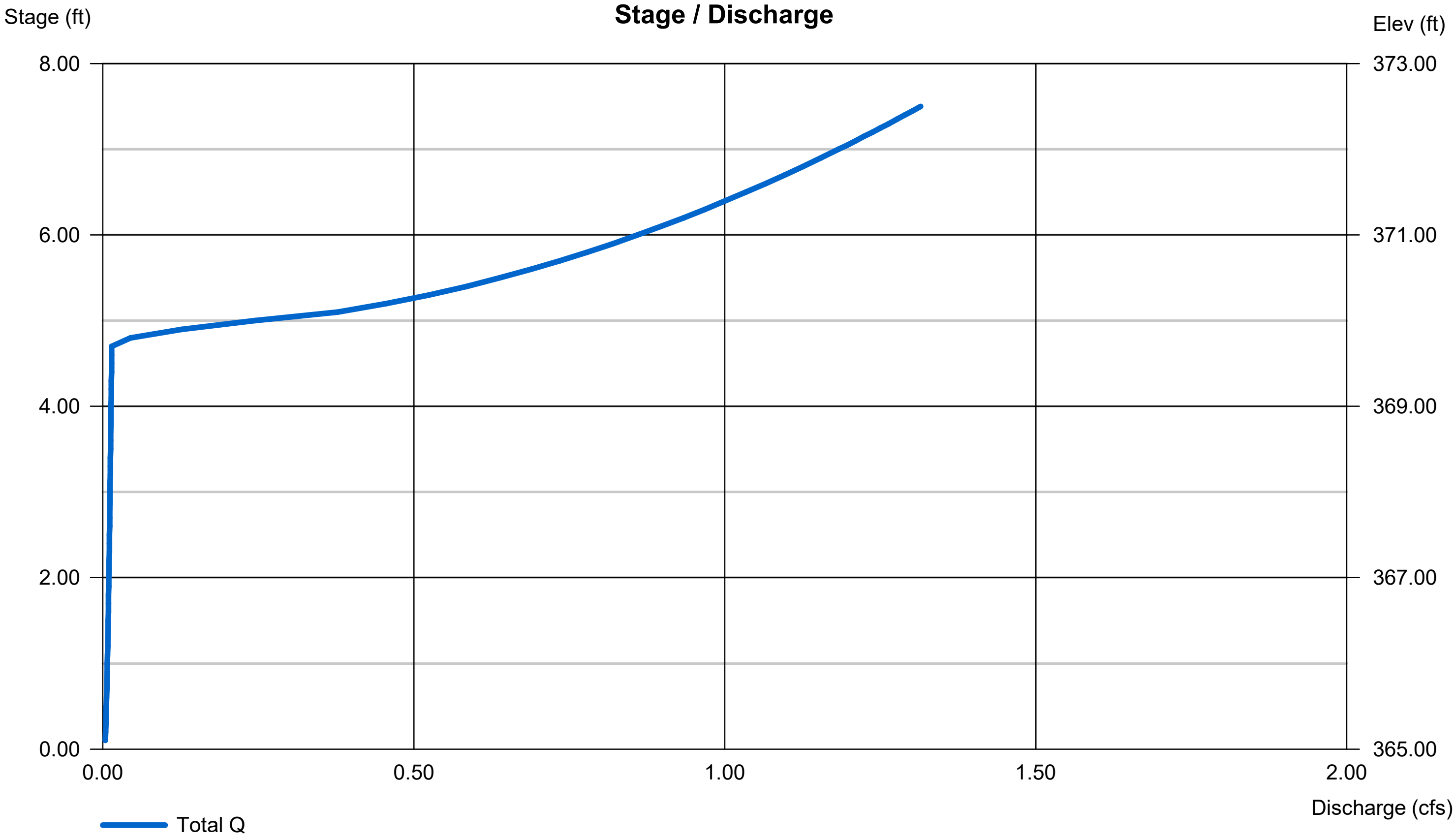
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.90	6.00	0.00	0.00
Span (in)	= 0.90	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 365.00	369.70	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



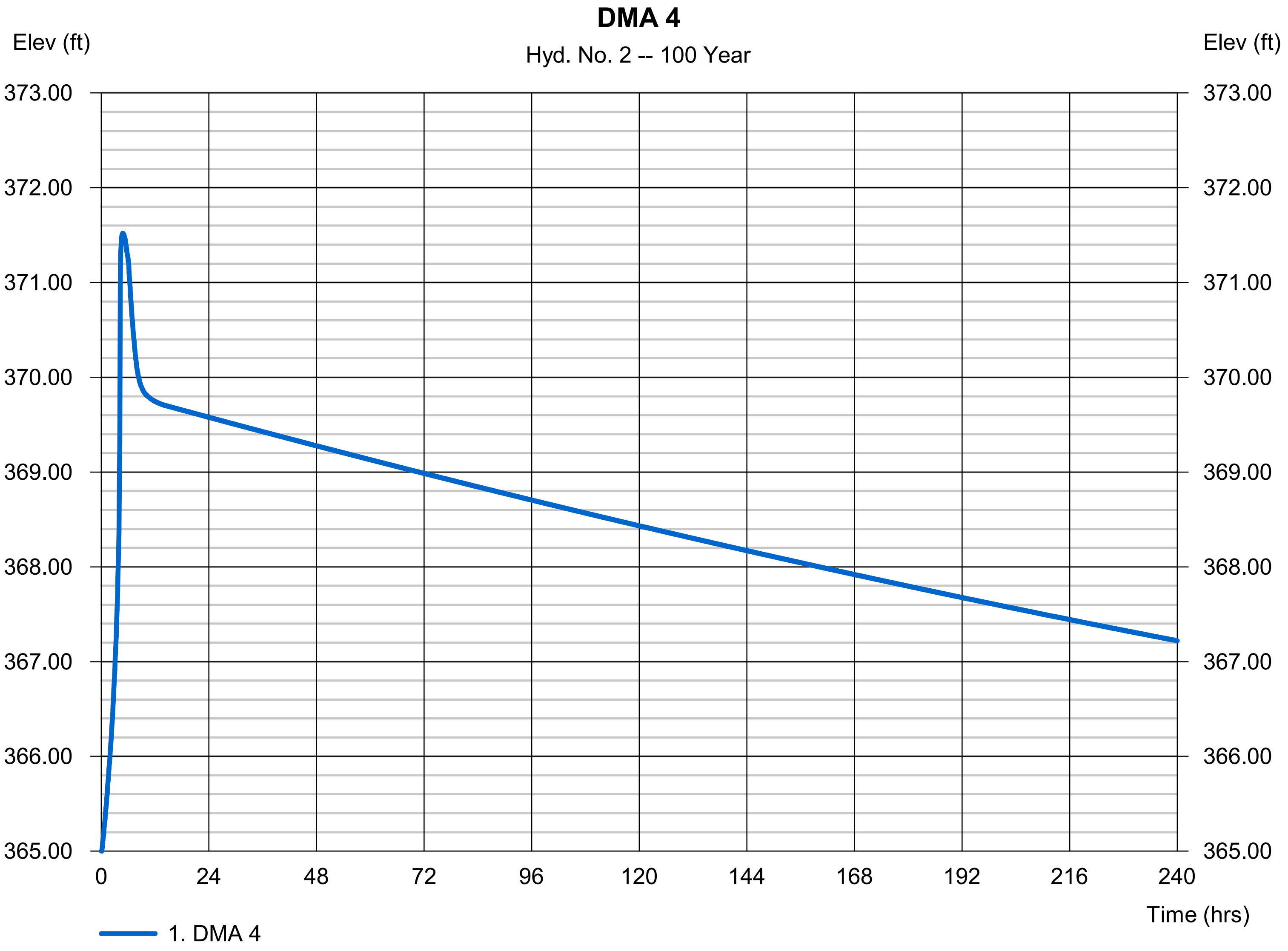
Hydrograph Report

Hyd. No. 2

DMA 4

Hydrograph type	= Reservoir	Peak discharge	= 1.040 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.80 hrs
Time interval	= 6 min	Hyd. volume	= 24,504 cuft
Inflow hyd. No.	= 1 - DMA 4	Max. Elevation	= 371.52 ft
Reservoir name	= DMA 4	Max. Storage	= 25,850 cuft

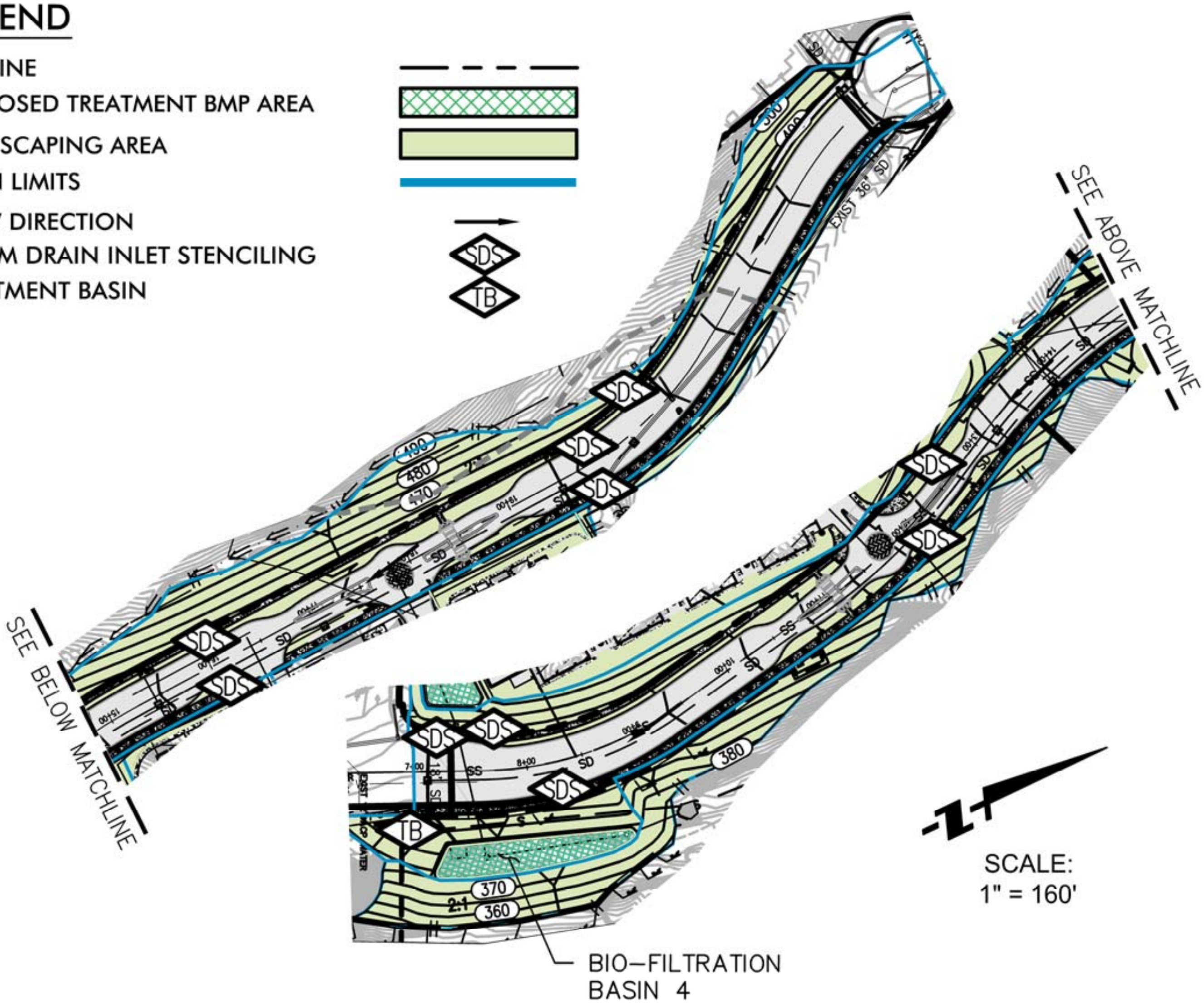
Storage Indication method used.



SWEETWATER VISTAS
STRUCTURAL BMP DMA MAPBOOK
DMA4 / BMP4

LEGEND

LOT LINE	— — —
PROPOSED TREATMENT BMP AREA	▨
LANDSCAPING AREA	🟩
BASIN LIMITS	━
FLOW DIRECTION	→
STORM DRAIN INLET STENCILING	SDS
TREATMENT BASIN	TB

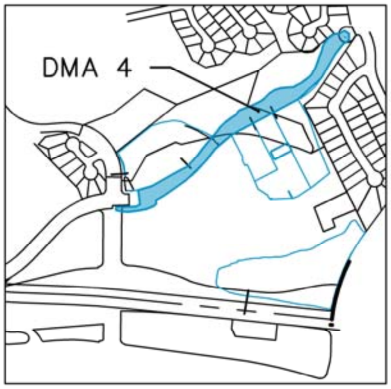


SCALE:
1" = 160'

DMA	BMP ID	MAINT. CATEGORY	BMP TYPE	SATISFIES HYDROMOD & WATER QUALITY REQ's	100-YEAR DETENTION
4	4	2-HOA	*BF BASIN + CISTERN	✓	✓

*BF= BIOFILTRATION BASIN

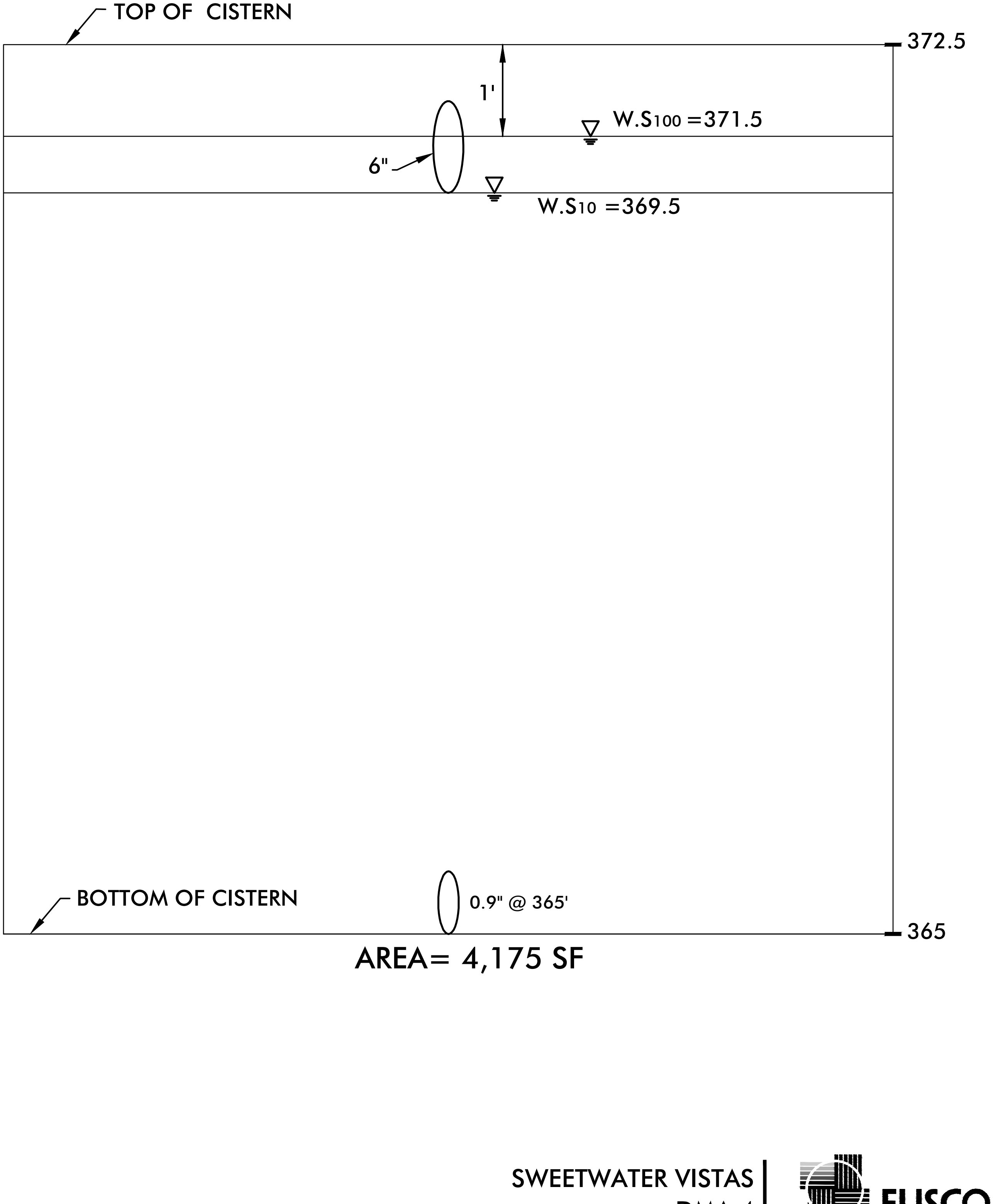
FUSCOE
ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com



INDEX MAP
NO SCALE

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\SWMP\BMP DMA MAPBOOK\DMA 4.DWG (10-18-2016 9:31:53AM) Plotted by: ESMITH

DMA 4



SWEETWATER VISTAS
DMA 4
DATE: 10/10/16

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ° fax 858.597.0335
www.fuscoe.com

APPENDIX 6: EXISTING DRAINAGE MAP

SCALE: 1"= 80'

80 40 0 80 160 240

GRAPHIC SCALE IN FEET

FUSCOE
ENGINEERING

6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

SWEETWATER VISTAS
EXISTING 100-YEAR HYDROLOGY
COUNTY OF SAN DIEGO, CA

PROJECT NUMBER: 2780-002
DATE: OCTOBER 18, 2016

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\HYDROLOGY\CAD\2780 EXIST HYDROLOGY.DWG (10-18-16 5:24:45PM)

APPENDIX 7: PROPOSED DRAINAGE MAP

LEGEND

PROJECT BOUNDARY	▬
BASIN BOUNDARY	▬
FLOW PATH	→
HYDROLOGY NODE	(XX)
PRE–TREATMENT CISTERN	☐
BIO–RETENTION BASIN	▨

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

SCALE: 1"= 80'

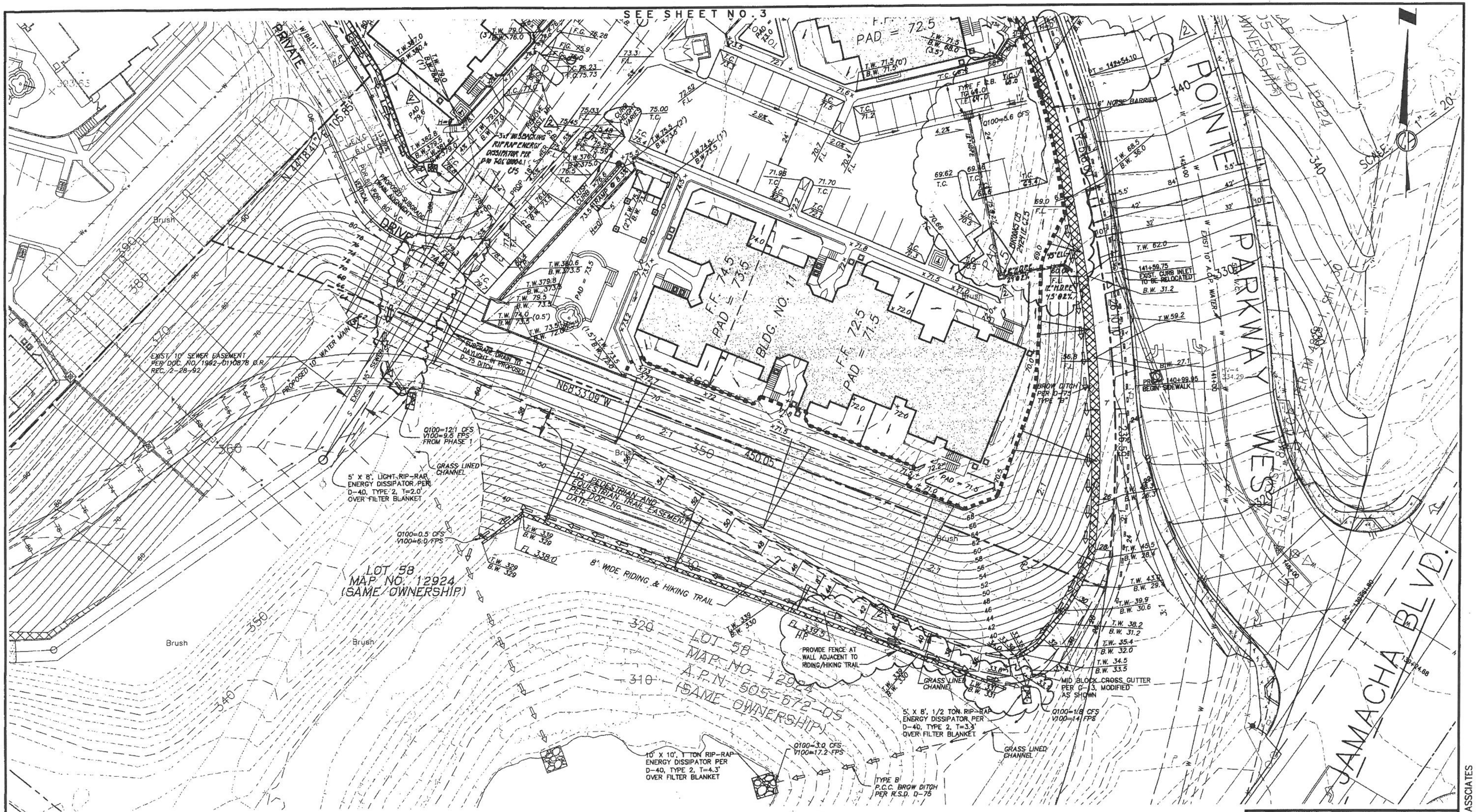
80 40 0 80 160 240
GRAPHIC SCALE IN FEET

SWEETWATER VISTAS
PROPOSED 100-YEAR HYDROLOGY
COUNTY OF SAN DIEGO, CA

PROJECT NUMBER: 2780-002
DATE: OCTOBER 18, 2016

F:\PROJECTS\2780\002_SUPPORT FILES\REPORTS\HYDROLOGY\CAD\2780 PROP HYDROLOGY.DWG (10–18–16 5:29:05PM) Plotted by: rroberts

APPENDIX 8: AS-BUILT DRAWINGS – EXISTING UTILITIES



SCALE: 1" = 20'

No. C39504
Exp.12-31-05

NOTE:

EXISTING TOPOGRAPHY IS BY AERIAL PHOTOGRAMMETRY BASED ON PHOTOGRAPHY DATED SEPTEMBER 10, 1999 SITE HAS BEEN PREVIOUSLY GRADED PER L-2130, SHEETS 10 & 13

RECORD PLAN

BY: Ralph E. Dilts DATE: 7·18·08
R.C.E. 39504
EXPIRES: 12·31·09

ENGINEER OF WORK

CRAIG & ASSOCIATES, INC.
CIVIL ENGINEERING - LAND SURVEYING - LAND PLANNING
2611 ADAMS AVE - SAN DIEGO, CA 92116 - (619) 297-3974

BENCH MARK

DESCRIPTION: CONCRETE MONUMENT W/STANDARD DISK
LOCATION: INT. JAMACHA BLVD. & SWEETWATER BLVD. 15' FROM END OF ASPHALT CB. 17' S.E. OF PP NO 270880
RECORD FROM: COUNTY OF SAN DIEGO
ELEVATION: 427.625 DATUM: M.S.L.

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:
1	NEW SHEET REPLACES SHEET 4		3/15/05
2	REVISE DRAINAGE 12" H.D.P.E. WITH "BURRITO WRAP" OF FABRIC & 3/4 CRUSHED ROCK.		8/14/05
3	MOVE P.C.C. DITCH		
4	RECORD PLAN		7/22/08

PRIVATE CONTRACT

SHEET 4A
COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
SHEETS 24

GRADING PLAN FOR:
LAKEVIEW POINTE
PHASE II

CALIFORNIA COORDINATE INDEX 202-1773

APPROVED: DOUGLAS M. ISBELL
COUNTY ENGINEER
BY: B Brosch
03/15/05

ENGINEER OF WORK Ralph Everett Dilts
Ralph E. Dilts 39504

L-14415
GRADING PERMIT NO.

W.O. 01-087

FILE NO.

ENGINEER'S NAME: CRAIG & ASSCIATES
PHONE NO. (619) 297-3974

J:\01-087 LakeView 2\dwg\GP\GP-1 SHTS 1-4.dwg, SHEET 4A, 3/11/2005 12:25:37 PM

GRADING PLANS
FOR
THE POINTE SAN DIEGO
TRACT 4828 RPL UNITS 4, 5, 6, & 7

GENERAL NOTES.

1. [illegible]

2. [illegible] FINAL GRADE ELEVATIONS [illegible] THESE PLANS.

3. [illegible] MATERIAL SHALL BE OBTAINED FROM A LEGAL SITE.

4. A CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DIRECTOR OF PUBLIC WORKS WILL BE REQUIRED FOR ANY WORK IN THE COUNTY RIGHT-OF-WAY.

5. ALL PERMANENT SLOPES OVER 3 FEET IN HEIGHT WILL BE PLANTED IN ACCORDANCE WITH SAN DIEGO SPECIFICATIONS, WITH NON-IRRIGATED HYDROSEED.

6. THE CONTRACTOR SHALL VERIFY THE EXISTENCE AND LOCATION OF ALL UTILITIES BEFORE COMMENCING WORK. NOTICE OF THE PROPOSED WORK SHALL BE GIVEN TO THE FOLLOWING AGENCIES:

UNDERGROUND SERVICE ALERT	1-800-422-4133
SAN DIEGO GAS & ELECTRIC	[illegible]
PACIFIC BELL TELEPHONE	[illegible]
CATV COX CABLE	[illegible]
SEWER: SPRING VALLEY SANITATION DISTRICT	[illegible]
WATER: OTAY WATER DISTRICT	[illegible]

7. A SOILS REPORT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A BUILDING PERMIT.

8. APPROVAL OF THESE PLANS BY THE DIRECTOR OF PUBLIC WORKS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND A VALID GRADING PERMIT HAS BEEN ISSUED.

9. THE DIRECTOR OF PUBLIC WORKS' APPROVAL OF THESE PLANS DOES NOT CONSTITUTE COUNTY BUILDING OFFICIAL APPROVAL OF ANY FOUNDATIONS FOR STRUCTURES TO BE PLACED ON THE AREA COVERED BY THESE PLANS OR APPROVAL OF ANY WAIVER OF THE TWO INCHES (2") OF EXPANSIVE SOIL COVER REQUIRED BY SECTION 87.403 AND THE THREE INCHES (3") OF EXPANSIVE SOIL COVER REQUIREL BY SECTION 87.410 OF THE SAN DIEGO COUNTY GRADING ORDINANCE. ANY SUCH WAIVER MUST BE OBTAINED FROM THE DIRECTOR OF PUBLIC WORKS.

10. ALL OPERATIONS CONDUCTED ON THE PREMISES, INCLUDING THE WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR RUNNING OF TRUCKS, EARTH MOVING EQUIPMENT, CONSTRUCTION EQUIPMENT AND ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00 a.m. AND 6:00 p.m. EACH DAY, MONDAY THROUGH SATURDAY, AND NO EARTH MOVING OR GRADING OPERATIONS SHALL BE CONDUCTED ON THE PREMISES ON SUNDAYS OR HOLIDAYS.

11. ALL MAJOR SLOPES SHALL BE ROUNDED INTO EXISTING TERRAIN TO PRODUCE A CONTOURED TRANSITION FROM CUT OR FILL FACES TO NATURAL GROUND AND ABUTTING CUT OR FILL SURFACES.

12. NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE GRADING PLANS, THE PERMITTEE IS RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO THE ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET, SIDEWALK, ALLEY, FUNCTION OF ANY SEWAGE DISPOSAL SYSTEM OR ANY OTHER PUBLIC OR PRIVATE PROPERTY WITHOUT SUPPORTING AND PROTECTING SUCH PROPERTY FROM SETTLING CRACKING, EROSION, SILTING, SCOUR OR OTHER DAMAGE WHICH MIGHT RESULT FROM THE GRADING DESCRIBED ON THIS PLAN. THE COUNTY WILL HOLD THE PERMITTEE RESPONSIBLE FOR CORRECTION OF NON-DEDICATED IMPROVEMENTS WHICH DAMAGE ADJACENT PROPARTY.

13. <u>SLOPE RATIOS</u>

    CUT 1.5:1 FOR MINOR SLOPES: 2:1 FOR MAJOR SLOPES OR AS SPECIFIED IN SOILS REPORT.

    FILL 2:1 OR AS SPECIFIED IN SOILS REPORT

    EXCAVATION: 369,500 C.Y. FILL: 369,500 C.Y.

    WASTE/IMPORT 0 C.Y.

    A SEPARATE PERMIT MUST BE OBTAINED FOR WASTE OR IMPORT AREA.

14. SPECIAL CONDITION: IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED ON THE SITE OF THIS GRADING DURING OPERATIONS, SUCH OPERATIONS WILL CEASE IMMEDIATELY AND THE PERMITTEE WILL NOTIFY THE DIRECTOR OF PUBLIC WORKS OF THE DISCOVERY. GRADING OPERATIONS WILL NOT RECOMMENCE UNTIL THE PERMITTEE HAS RECEIVED WRITTEN AUTHORITY FROM THE DIRECTOR OF PUBLIC WORKS TO DO SO.

15. ALL GRADING DETAILS WILL BE IN ACCORDANCE WITH SAN DIEGO COUNTY STANDARD DRAWING; DS-8, DS-10, DS-11, DS-75.

16. THE CONSTRUCTION OF ONE PCC STANDARD DRIVEWAY PER LOT, LOCATION TO BE DETERMINED IN THE FIELD BY THE ENGINEER OF WORK. PCC SURFACING OF DRIVEWAY TO EXTEND FROM CURB TO PROPERTY LINE. USE STANDARD DRAWINGS G-14, G-15, AND G-16. (SEE IMPROVEMENT PLANS TM 4828-4, 5, 6, 7)

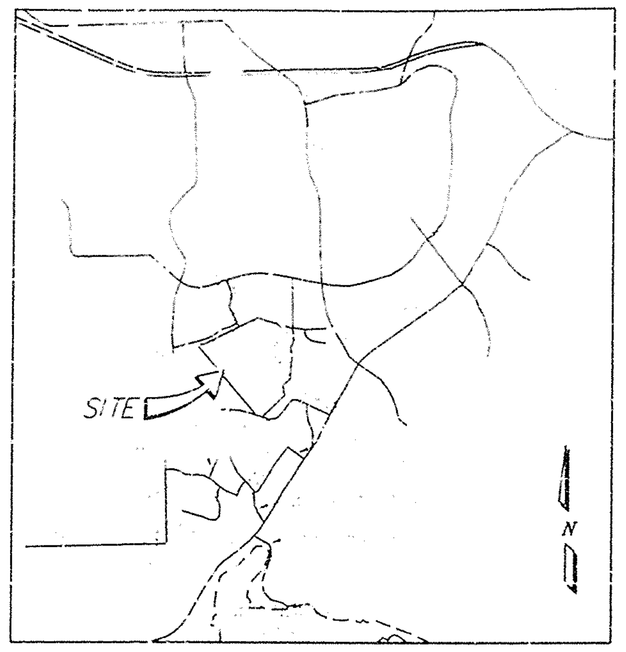
17. FOR STREET AND DRAINAGE IMPROVEMENTS SEE IMPROVEMENT PLAN TM 4828-4, 5, 6, AND 7.

18. A LICENSED ENGINEERING GEOLOGIST SHALL BE RETAINED TO CONDUCT A SUBSURFACE INVESTIGATION OF ALL PROPOSED GRADING SITES TO ADDRESS GEOTECHNICAL REPORTS, DEGREES OF RECOMPACTION OF FRIANT AND SWEETWATER FORMATION SOILS, EVALUATE FOUNDATION DESIGN IN THE SANTIAGO VOLCANICS, AND GRADING SPECIFICATIONS FOR SOIL AND ROCK FILLS. THE GEOLOGIST SHALL INITIAL APPROVAL OF ALL GRADING PLANS.

19. A LICENSED ENGINEERING GEOLOGIST SHALL BE RETAINED TO CONDUCT AN INVESTIGATION OF THE ABILITY OF ISHAM SPRINGS TO MAINTAIN THE CURRENT RATE OF FLOW AFTER BLASTING OF NEARBY IGNEOUS ROCK HAS OCCURRED. UNLESS THIS REPORT STATES OTHERWISE, BLASTING SHALL BE NO CLOSER THAN 500 FEET FROM ISHAM SPRINGS.

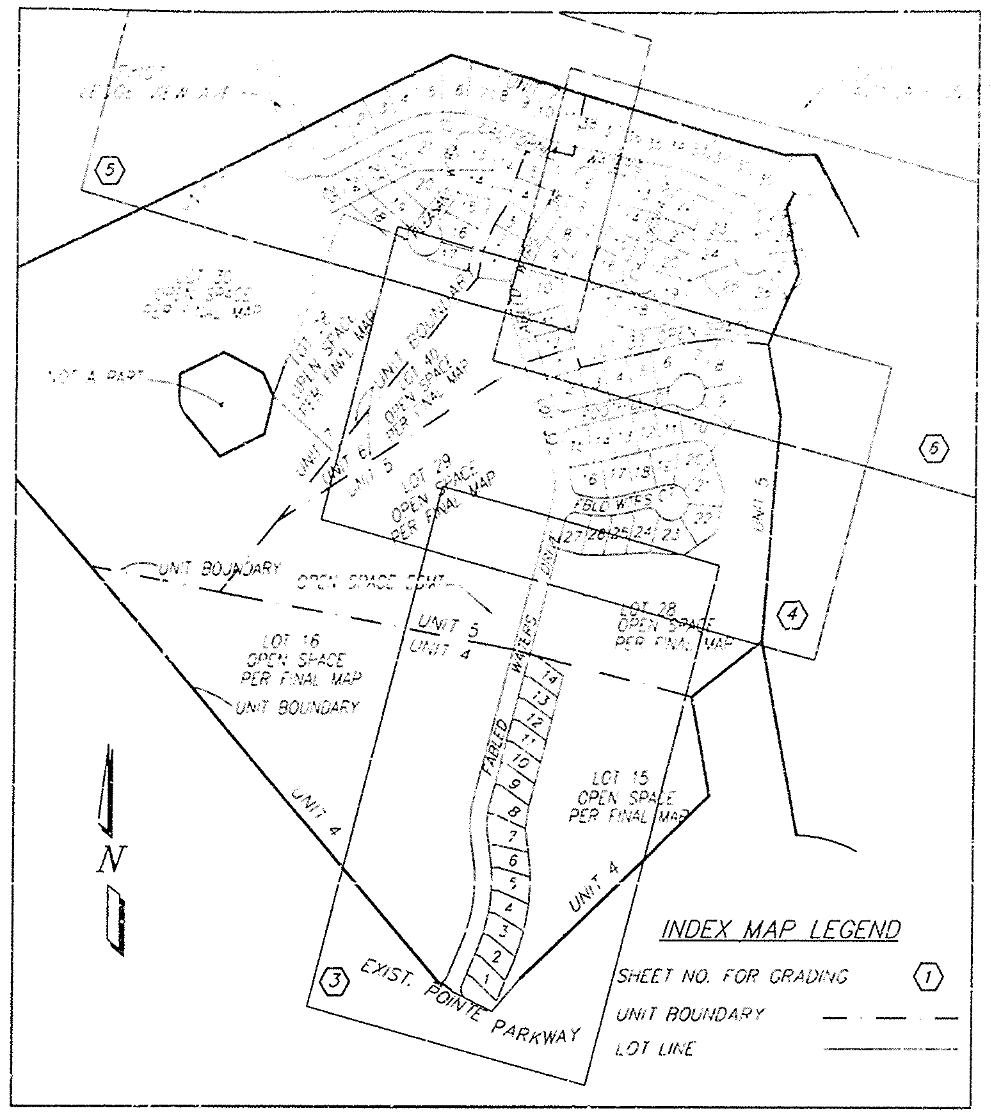
20. THIS PLAN SHALL CONFORM WITH THE RECOMMENDATIONS OF THE SOILS REPORT REGARDING SITE PREPARATION, FOOTINGS, DISTANCE FROM THE FILL SLOPE TOP, AND OTHER SPECIFICATIONS.

21. GRADING INDICATED ON THE FINAL GRADING PLANS SHALL BE IN SUBSTANTIAL CONFORMANCE WITH THAT SHOWN ON THE APPROVED REPLACEMENT TENTATIVE MAP, DATED APRIL 3, 1990. ANY DEVIATION FROM THE REPLACEMENT TENTATIVE MAP GRADING PLANS IN EXCESS OF TEN PERCENT OF THE TOTAL GRADING QUANTITIES AND/OR TOTAL GRADING QUANTITIES IN EXCESS OF 350,000 CUBIC YARDS OF EARTHWORK MAY REQUIRE ADDITIONAL ENVIRONMENTAL REVIEW. ANY DEVIATION IN MAXIMUM SLOPE HEIGHTS FROM THE APPROVED TENTATIVE MAP IN EXCESS OF FIVE FEET MAY ALSO REQUIRE ADDITIONAL ENVIRONMENTAL REVIEW.



VICINITY MAP

NOT TO SCALE



INDEX MAP LEGEND

SHEET NO. FOR GRADING	①
UNIT BOUNDARY	— · — ·
LOT LINE	——

SHEET INDEX

Scale 1" = 300'

TABLE OF CONTENTS

SOILS ENGINEER'S CERTIFICATE

THESE GRADING PLANS HAVE BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN COMPLIANCE WITH THE RECOMMENDATIONS OUTLINED IN OUR SOILS REPORT DATE 8/26/96

BY _____ DATE 6/29/98
NAME

RCE No 43345 / GE 2173 EXPIRES 6·30·00

BY Jay F. Lynch DATE 6/26/98
NAME

CEG No. 1890 EXPIRES 5/00

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE

APPROVED FOR COMPLIANCE WITH TM CONDITIONS: C.6.a.(1,2,3); C.6.b.(1,2); AND C.6.b.5; C.6.b.(7,8); C.6.b.10; C.6.C.(1,2,3); C.10; C.12.b; C.18.d, IN SUBSTANTIAL CONFORMANCE WITH THE TENTATIVE MAP (4828RPL) (UNIT 4,5,6,7 ONLY)

APPROVED BY _____ 6 24 98
COUNTY OF SAN DIEGO DATE

SOLAR STATEMENT

THIS IS A SOLAR SUBDIVISION AS REQUIRED BY SECTION 81-401(N), SUBDIVISION ORDINANCE. ALL LOTS HAVE AT LEAST 100 SQ. FT. OF UNOBSTRUCTED ACCESS TO SUNLIGHT ON THE BUILDABLE PORTION OF THE LOT.

BY Manuel Nieto DATE 7/2/98
NAME

RCE No. 30724 EXPIRES 6/30/00

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

DAVID EVANS AND ASSOCIATES, INC.
7676 HAZARD CENTER DRIVE SUITE 880
SAN DIEGO, CA 92108
(619) 294-7260

BY Manuel Nieto DATE 7/2/98
NAME: MANUEL NIETO

PCE No. 30724 EXPIRES 6/30/00

DAVID EVANS
AND ASSOCIATES, INC.
7676 HAZARD CENTER DRIVE, SUITE 880
SAN DIEGO, CA 92108 (619) 260-3420

LEGAL DESCRIPTION

[illegible]

WORK TO BE DONE:

THE IMPROVEMENTS [illegible] ACCORDING TO THESE PLANS [illegible] DEPARTMENT OF PUBLIC WORKS STANDARD SPECIFICATIONS [illegible] REGIONAL STANDARD DRAWINGS [illegible] OF THE OTAY WATER DISTRICT.

IMPROVEMENTS	STD. DWGS.	QUANTITY	SYMBOL
[illegible]		[illegible]	
[illegible]		[illegible]	▼ ▼ ▼ ▼
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]		[illegible]	
[illegible]			
TYPE "B" CURB INLET	[illegible]	[illegible]	
TYPE "A" CURB INLET	[illegible]	[illegible]	
SUBDIVISION BOUNDARY			— — —
PROPOSED [illegible] PERMANENT DESILT BASIN			
DIRECTION OF SURFACE FLOW			→
PROPOSED BROW DITCH (TYPE AS SHOWN ON PLAN)	[illegible]	[illegible]	
RETAINING WALL		[illegible]	▬ ▬
STABILIZED CONSTRUCTION ENTRANCE			
TYPE "F" CATCH BASIN	[illegible]	[illegible]	
GRAVEL BAGS		[illegible]	
STRAW BALE DIKE (4 BALES PER DIKE)			
SILT FENCE		[illegible]	
TEMPORARY FENCING			◆◆◆◆◆◆◆
HEADWALL	D-34,D-35*	[illegible]	
RIP RAP ENERGY DISSIPATER	D-40*	[illegible]	

* SAN DIEGO REGIONAL STANDARD DRAWING, UNLESS OTHERWISE NOTED.

NOTE:
QUANTITIES ARE SHOWN FOR BOND PURPOSES ONLY.
CONTRACTOR IS RESPONSIBLE FOR BID QUANTITIES PER PLAN

PERMITTEE:

NAME: ATLAS HOMES
ADDRESS: 2721 POINTE PARKWAY
SPRING VALLEY, CA 91977
PHONE: (619) 660-[illegible]

SITE ADDRESS:

ADDRESS: POINTE SAN DIEGO
A.P.N. #: [illegible]

OWNER:

NAME: ATLAS HOMES
ADDRESS: 2721 POINTE PARKWAY
SPRING VALLEY, CA 91977
PHONE: (619) 660-[illegible]

ENGINEER OF WORK

MANUEL NIETO 7/2/98
No. 30724
Exp. 6/30/00

COUNTY APPROVED CHANGES

No.	Description	Approved by	Date

PERMITS

HPL 96-002
MAJOR USE PERMIT P89-014, 015, 016
REZONE PERMIT NO. R88-09
SPECIAL USE PERMIT NO. SPA 88-001
TENTATIVE MAP NO. TM 4828RPL UNITS 4, 5, 6, 7
N.O.I.

BENCH MARK

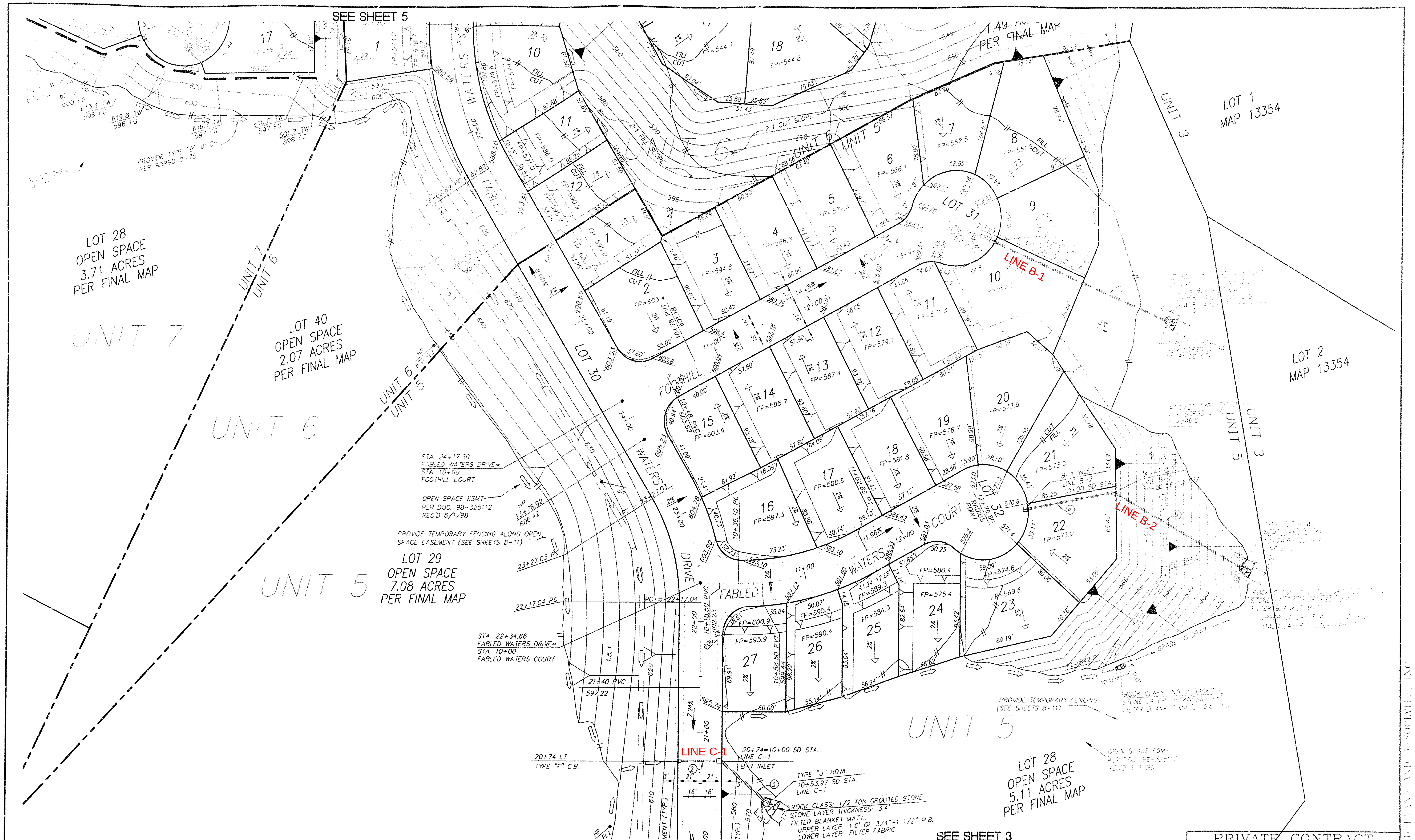
DESCRIPTION: CONCRETE MONUMENT WITH STANDARD DISK
LOCATION: AT JAMACHA BLVD. & SWEETWATER BLVD. [illegible] FROM END OF ASPHALT [illegible]
RECORD FROM: COUNTY VERTICAL CONTROL [illegible]
ELEVATION: 420.625 [illegible] MEAN SEA LEVEL

PRIVATE CONTRACT

SHEET 1 OF 13

GRADING PLANS FOR
POINTE SAN DIEGO
[illegible]

Manuel Nieto R.C.E. 30724



○ STORM DRAIN DATA						
L/C	DELTA	BEARING	RADIUS	DIST.	REMARK	D-LOAD
4		N85°40'19"W		81.56'	18" RCP	1350-D
5		N45°49'53"W		137.10'	18" RCP	1350-D
6		N51°40'40"W		179.00'	18" RCP	1350-D

NOTE:
1. FOR STREET & DRAINAGE IMPROVEMENTS PLEASE SEE TM 4828-4, 5, 6, & 7.
2. FOR TYPICAL PAD GRADING, SEE DETAIL ON SHEET 2.
3. FOR STORM DRAIN PROFILES, SEE SHEET 7.

ENGINEER OF WORK

REGISTERED PROFESSIONAL ENGINEER
MANUEL E. NIETO
No. 30724
Exp. 6/30/00
CIVIL
STATE OF CALIFORNIA

MANUEL E. NIETO R.C.E. 30724
EXPIRES ON 6/30/00

7/2/98
DATE

DAVID EVANS
AND ASSOCIATES, INC.
7676 HAZARD CENTER DRIVE, SUITE 880
SAN DIEGO, CA 92108 (619) 260-3420

COUNTY APPROVED CHANGES

No.	Description	Approved by	Date

PERMITS

HPL 96-002
MAJOR USE PERMIT P89-014, 015, 016
REZONE PERMIT NO. R88-09
SPECIAL USE PERMIT NO. SPA 88-001
TENTATIVE MAP NO. TM 4828RPL UNITS 4, 5, 6, 7
N.O.I.

BENCH MARK

DESCRIPTION: CONCRETE MONUMENT WITH STANDARD [illegible]
LOCATION: INT. JAMACHA BLVD. & SWEETWATER [illegible]
FROM END OF ASPHALT C.B. [illegible]
RECORD FROM: COUNTY VERTICAL CONTROL [illegible]
ELEVATION: 427.625 DATUM: MEAN SEA LEVEL

PRIVATE CONTRACT

4 [illegible] 13

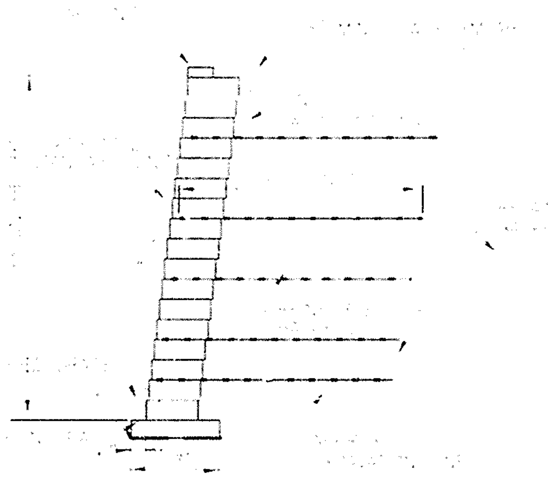
POINTE SAN DIEGO

30724

PRECISION
AUG 10 1998
CROFILMED

○ STORM DRAIN DATA

[illegible]	DELTA	BEARING	RADIUS	DIST.	REMARK	D-LOAD
7	49°52'32"		22.00'	19.15'	24" RCP	1350-D
8		N40°13'25"E		107.20'	24" RCP	1350-D
9	49°58'35"		89.00'	77.63'	24" RCP	1350-D
10		N09°45'09"W		22.25'	24" RCP	1350-D
11	83°43'57"		30.00'	44.37'	24" RCP	1350-D
12		N02°57'58"W		3.19'	24" RCP	1350-D
13	54°55'32"		50.00'	47.93'	24" RCP	1350-D
14		N51°57'34"E		32.55'	24" RCP	1350-D
15		N60°37'23"E		19.35'	30" RCP	1350-D
16	11°33'23"		100.00'	20.17'	30" RCP	1350-D
17		N72°10'47"W		149.27'	30" RCP	1350-D
18	06°39'29"		489.00'	56.82'	30" RCP	1350-D
19		N79°50'16"W		24.51'	30" RCP	1350-D
20		N11°09'44"E		55.00'	18" RCP	1350-D

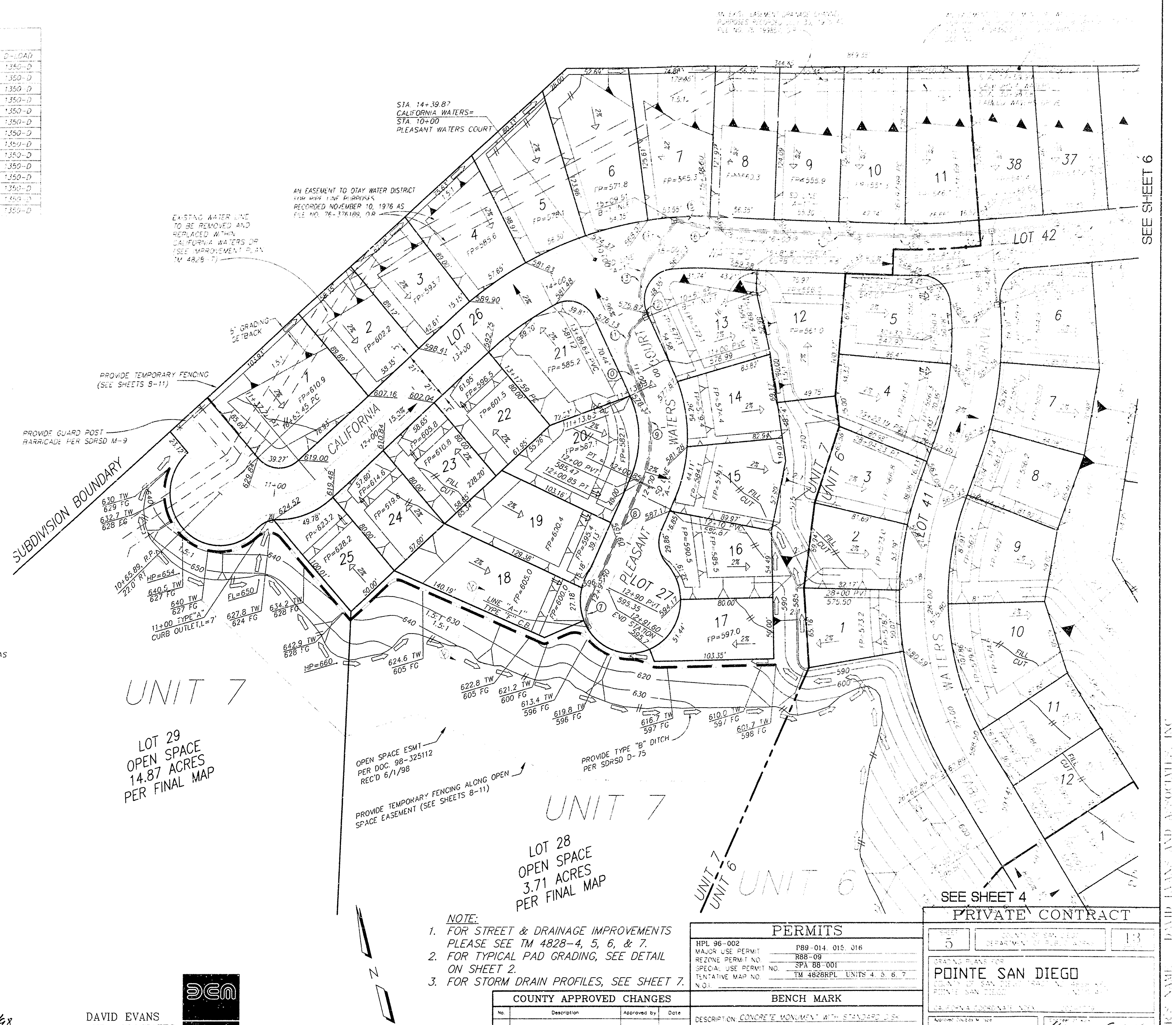


KEYSTONE RETAINING WALL (TYP)

SECTION A–A

NOT TO SCALE

1. KEYSTONE RETAINING WALL WILL BE CONSTRUCTED WITH FULL SPECIAL INSPECTION ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.
2. KEYSTONE RETAINING WALL WILL BE CERTIFIED BY THE ENGINEER OF WORK AS BEING CONSTRUCTED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.



NOTE:
1. FOR STREET & DRAINAGE IMPROVEMENTS PLEASE SEE TM 4828–4, 5, 6, & 7.
2. FOR TYPICAL PAD GRADING, SEE DETAIL ON SHEET 2.
3. FOR STORM DRAIN PROFILES, SEE SHEET 7.

40' 0' 40' 80' 120'
GRAPHIC SCALE: 1"=40'

ENGINEER OF WORK

REGISTERED PROFESSIONAL ENGINEER MANUEL E. NIETO No. 30724 Exp. 6/30/00 CIVIL STATE OF CALIFORNIA

Manuel E. Nieto 7/2/98
MANUEL E. NIETO R.C.E. 30724 DATE
EXPIRES ON 6/30/00

DEA
DAVID EVANS
AND ASSOCIATES, INC.
7676 HAZARD CENTER DRIVE, SUITE 880
SAN DIEGO, CA. 92108 (619) 260-3420

COUNTY APPROVED CHANGES

No.	Description	Approved by	Date

PERMITS

HPL 96-002
MAJOR USE PERMIT P89-014, 015, 016
REZONE PERMIT NO. R88-09
SPECIAL USE PERMIT NO. SPA 88-001
TENTATIVE MAP NO. TM 4828RPL UNITS 4, 5, 6, 7
N.O.I.

BENCH MARK

DESCRIPTION: CONCRETE MONUMENT WITH STANDARD DISK
LOCATION: INT. JAMACHA BLVD. & SWEETWATER BLVD. [illegible] FROM END OF ASPHALT C.B. [illegible]
RECORD FROM: COUNTY VERTICAL CONTROL [illegible]
ELEVATION: 427.625 DATUM: MEAN SEA LEVEL

PRIVATE CONTRACT

SHEET 5
COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS
13 SHEETS

GRADING PLANS FOR
POINTE SAN DIEGO
COUNTY OF SAN DIEGO TRACT NO. [illegible]
POINTE SAN DIEGO [illegible]
CALIFORNIA COORDINATE INDEX [illegible]

Approved Douglas M. Isbell
County Engineering

Engineer of Work
Manuel E. Nieto
R.C.E. 30724

ENGINEER'S NAME DAVID EVANS AND ASSOCIATES, INC.
PHONE NO. (619) 260-3420

○ STORM DRAIN DATA						
L/C	DELTA	BEARING	RADIUS	DIST.	REMARK	D-LOAD
21		N78°50'16"W		137.37'	30" RCP	1350-D
22		N48°31'02"E		34.02'	18" RCP	1350-D
23		N78°50'16"W		82.92'	30" RCP	1350-D
24	13°55'27"		561.00'	136.34'	30" RCP	1350-D
25		N25°17'26"E		27.04'	18" RCP	1350-D
26	05°53'27"		561.00'	57.68'	30" RCP	1350-D
27		N58°36'49"W		29.90'	30" RCP	1350-D
28	15°29'02"		30.00'	8.11'	30" RCP	1350-D
29		N74°05'51"W		12.95'	30" RCP	1350-D
30		N75°08'21"E		76.30'	30" RCP	1350-D
31		N83°11'52"W		20.33'	30" RCP	1350-D

UNIT 5

NOTE:

1. FOR STREET & DRAINAGE IMPROVEMENTS PLEASE SEE TM 4828-4, 5, 6, & 7.
2. FOR TYPICAL PAD GRADING, SEE DETAIL ON SHEET 2.
3. FOR STORM DRAIN PROFILES, SEE SHEET 7.

ENGINEER OF WORK

REGISTERED PROFESSIONAL ENGINEER MANUEL E. NIETO No. 30724 Exp. 6/30/00 CIVIL STATE OF CALIFORNIA

Manuel E. Nieto 7/2/98

MANUEL E. NIETO R.C.E. 30724 DATE
EXPIRES ON 6/30/00

DEA

DAVID EVANS
AND ASSOCIATES, INC.
7676 HAZARD CENTER DRIVE, SUITE 880
SAN DIEGO, CA. 92108 (619) 260-3420

40' 0' 40' 80' 120'
GRAPHIC SCALE: 1"=40'

COUNTY APPROVED CHANGES

No.	Description	Approved by	Date

PERMITS

HPL 96-002
MAJOR USE PERMIT P89-014, 015, 016
REZONE PERMIT NO. R88-09
SPECIAL USE PERMIT NO. SPA 88-001
TENTATIVE MAP NO. TM 4828RPL UNITS 4, 5, 6, 7
N.O.I.

BENCH MARK

DESCRIPTION: CONCRETE MONUMENT WITH STANDARD DISK
LOCATION: INT. JAMACHA BLVD. & SWEETWATER BLVD. 15' FROM END OF ASPHALT C.B. 17' S.E. OF PP# 270860
RECORD FROM: COUNTY VERTICAL CONTROL - JM 0144
ELEVATION: 427.625 DATUM: MEAN SEA LEVEL

PRIVATE CONTRACT

SHEET 6 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 13 SHEETS

GRADING PLANS FOR:
POINTE SAN DIEGO
COUNTY OF SAN DIEGO TRACT NO. 4828 RPL
POINTE SAN DIEGO UNITS 4-7

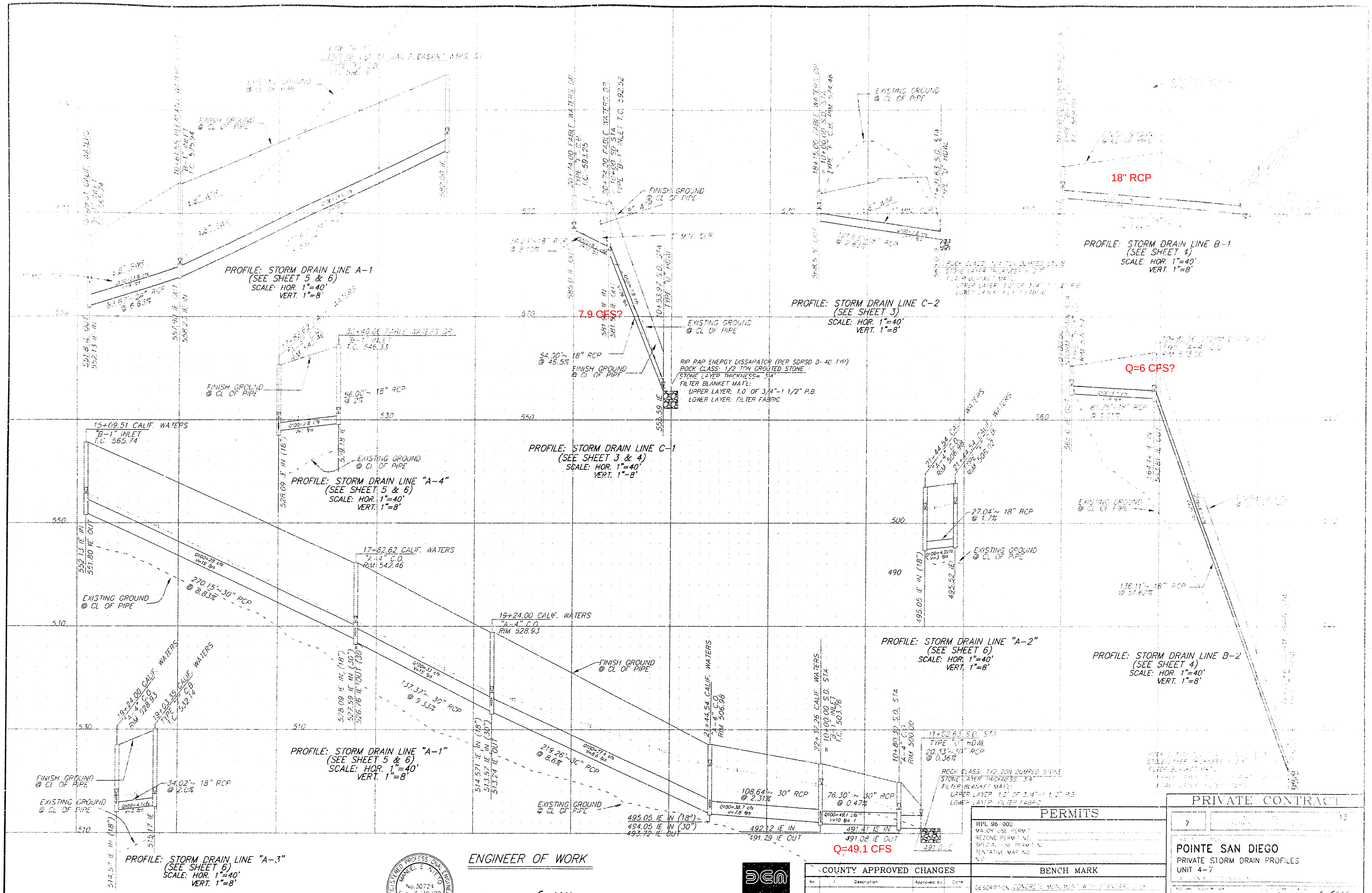
CALIFORNIA COORDINATE INDEX [illegible]

Approved Douglas M. Isbell
County Engineering
BY [illegible]

Engineer of Work
Manuel E. Nieto
R.C.E. 30724

GRADING PERMIT L-2907

ENGINEER'S NAME: DAVID EVANS AND ASSOCIATES, INC.
PHONE NO. (619) 260-3420



ENGINEER OF WORK

No. 30724 Exp. 6/30/00

MANUEL E. NIETO R.C.E. 30724 7/2/98
EXPIRES ON 6/30/00 DATE

DAVID EVANS
AND ASSOCIATES, INC.
7676 HAZARD CENTER DRIVE, SUITE 880
SAN DIEGO, CA. 92108 (619) 260-3420

COUNTY APPROVED CHANGES

No	Description	Approved by	Date

PERMITS

HPL 96-002
MAJOR USE PERMIT
REZONE PERMIT NO.
SPECIAL USE PERMIT NO.
TENTATIVE MAP NO.

BENCH MARK

DESCRIPTION: CONCRETE MONUMENT
LOCATION: AT JAMACHA BLVD & SWEETWATER
RECORD FROM: COUNTY VERTICAL CONTROL
ELEVATION: 427.625

PRIVATE CONTRACT

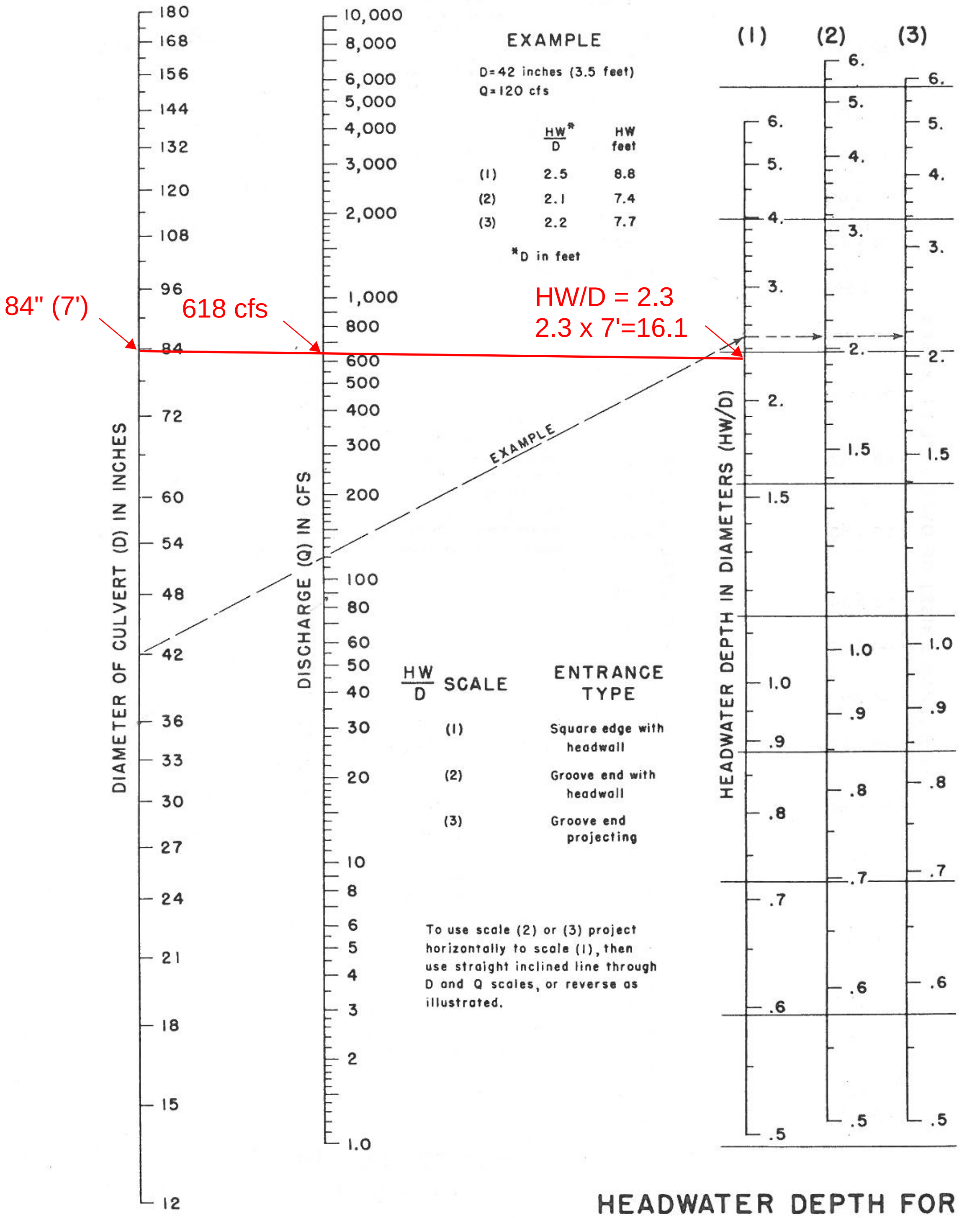
7 13

POINTE SAN DIEGO
PRIVATE STORM DRAIN PROFILES
UNIT 4-7

L-2907

PRECISION
AUG 10 1998
MICROFILMED

APPENDIX 9: HEC-RAS STUDY



EXAMPLE

D=42 inches (3.5 feet)
Q=120 cfs

	$\frac{HW}{D}$*	HW feet
(1)	2.5	8.8
(2)	2.1	7.4
(3)	2.2	7.7

*D in feet

$\frac{HW}{D}$ SCALE	ENTRANCE TYPE
(1)	Square edge with headwall
(2)	Groove end with headwall
(3)	Groove end projecting

To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

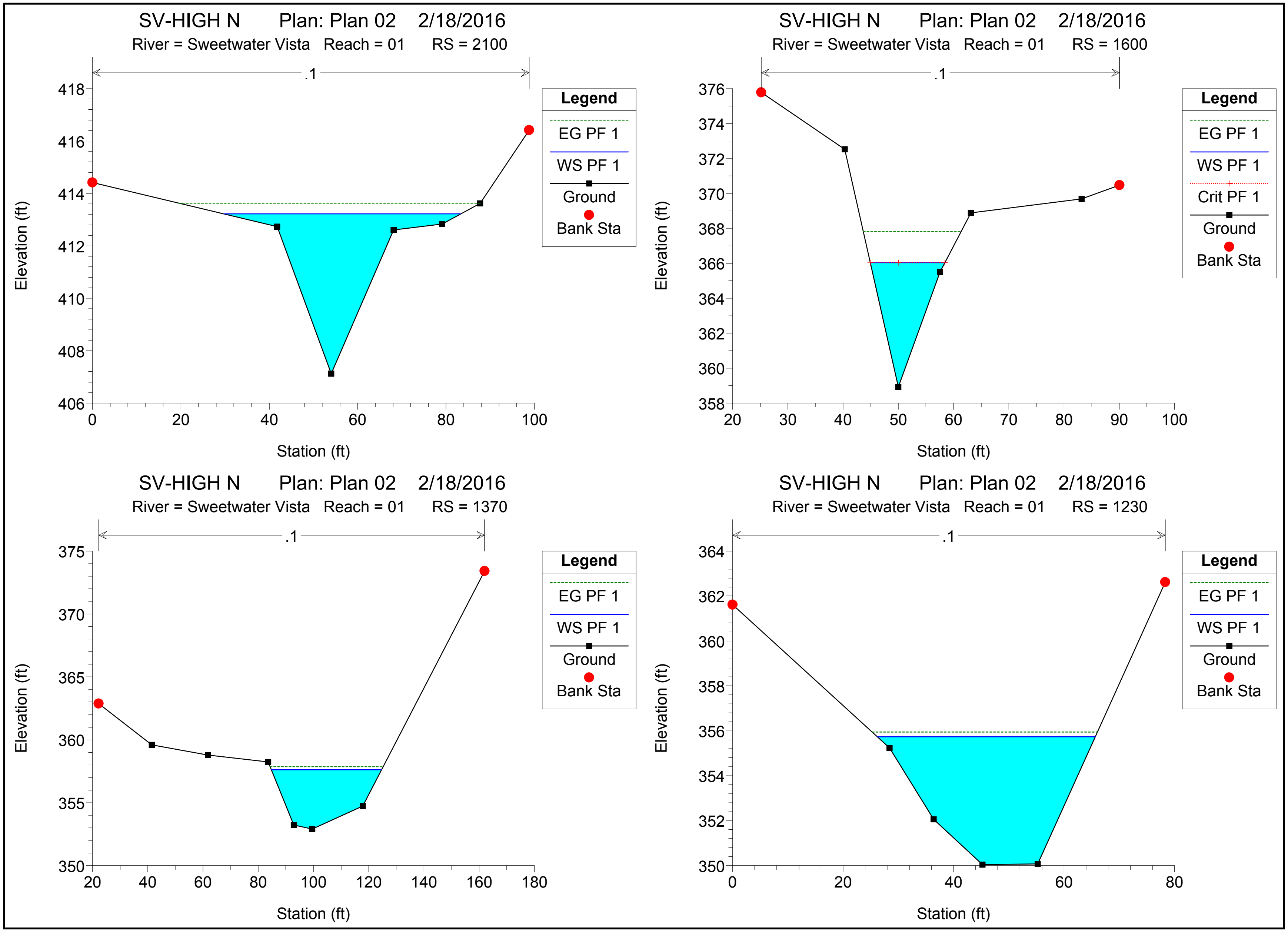
BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

EXISTING 84" SD ~ ELEV 314 AT ENTRANCE

314 + 16.1 => W.S. = 330.1

USE KNOWN W.S. ELEV 330.1 AT RIVER STA 1+20



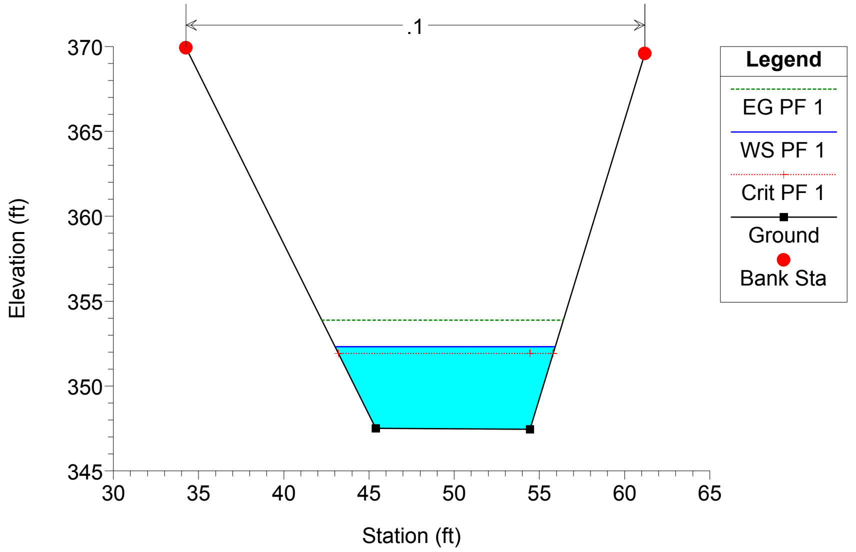
SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 2100

SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 1600

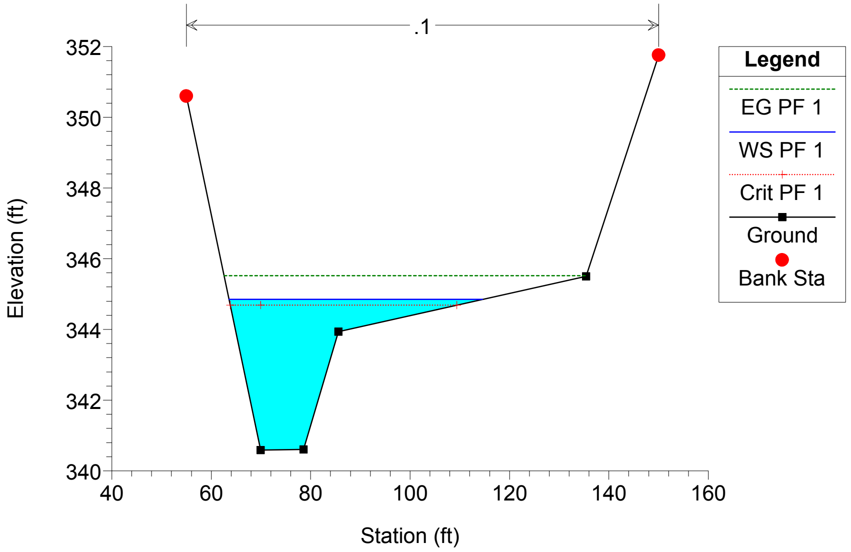
SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 1370

SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 1230

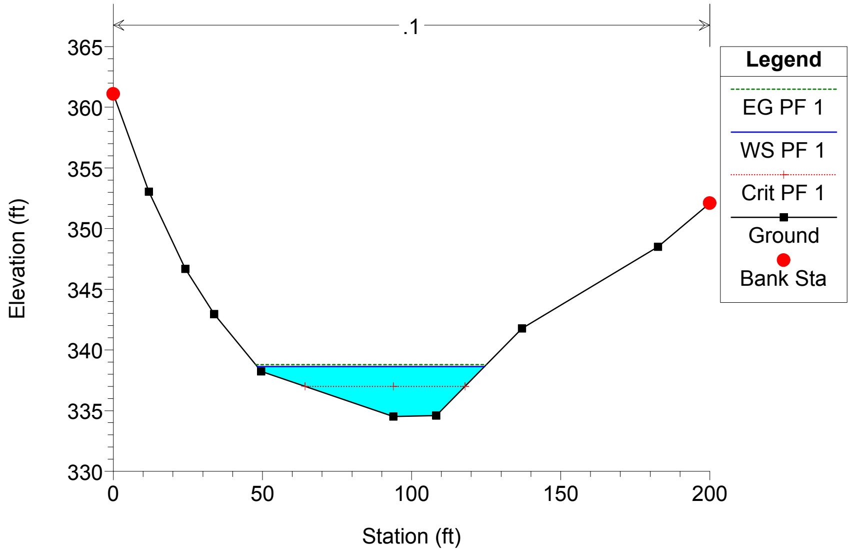
SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 1160



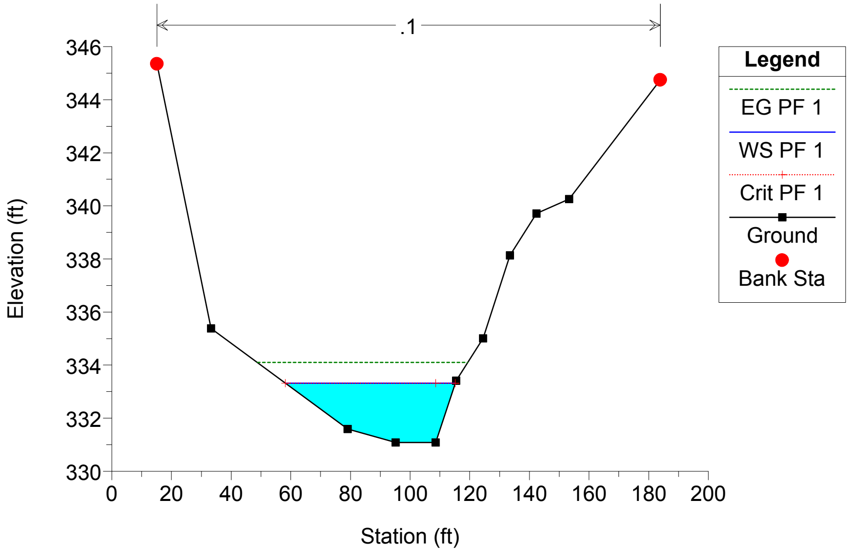
SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 1090

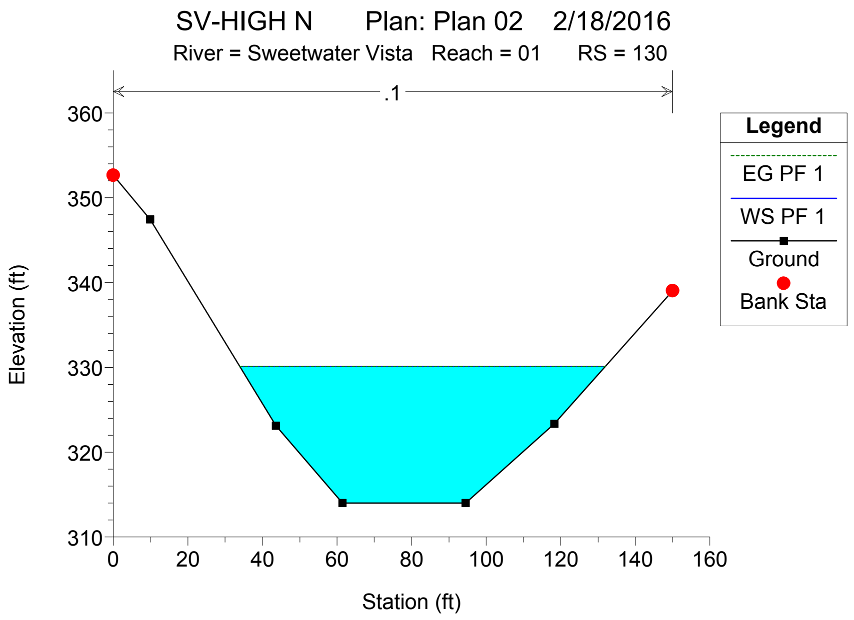


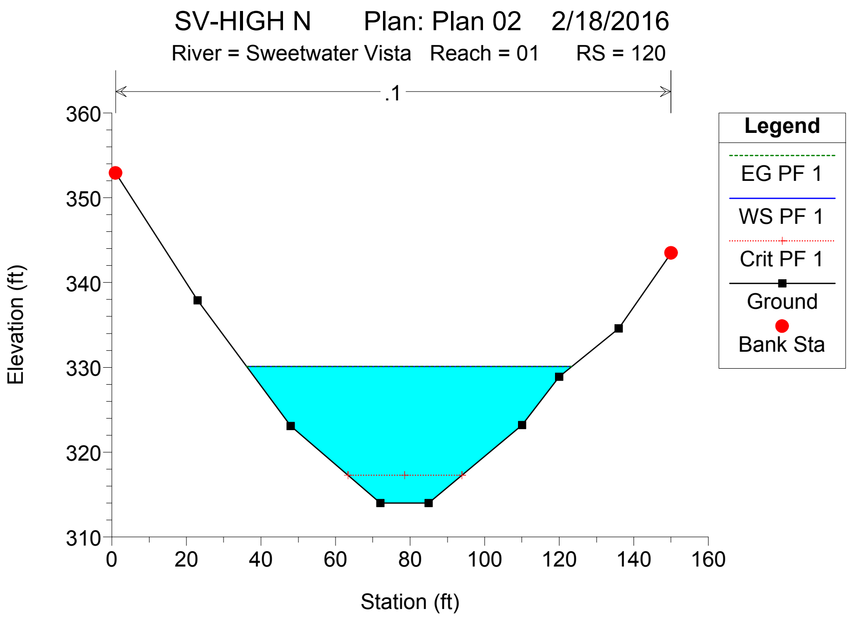
SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 850



SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 700




SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 130
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
360
350
340
330
320
310
0
20
40
60
80
100
120
140
160
Station (ft)


SV-HIGH N Plan: Plan 02 2/18/2016
River = Sweetwater Vista Reach = 01 RS = 120
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
360
350
340
330
320
310
0
20
40
60
80
100
120
140
160
Station (ft)

HEC-RAS Plan: Plan 02 River: Sweetwater Vista Reach: 01 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
01	2100	PF 1	500.00	407.12	413.22		413.63	0.057978	5.16	96.85	53.60	0.68
01	1600	PF 1	506.00	358.92	366.04	366.04	367.82	0.163272	10.72	47.21	13.51	1.01
01	1370	PF 1	506.00	352.90	357.61		357.86	0.016070	3.97	127.52	39.92	0.39
01	1230	PF 1	534.00	350.04	355.73		355.94	0.011767	3.69	144.68	39.42	0.34
01	1160	PF 1	534.00	347.46	352.31	351.92	353.89	0.121447	10.09	52.94	12.91	0.88
01	1090	PF 1	534.00	340.59	344.85	344.69	345.52	0.110378	6.57	81.32	50.96	0.92
01	850	PF 1	599.00	334.51	338.62	337.00	338.78	0.013109	3.13	191.62	76.23	0.35
01	700	PF 1	618.00	331.08	333.32	333.32	334.10	0.130250	7.09	87.19	56.93	1.01
01	130	PF 1	618.00	314.00	330.10		330.11	0.000065	0.57	1089.43	98.00	0.03
01	120	PF 1	618.00	314.00	330.10	317.27	330.11	0.000123	0.72	857.91	87.19	0.04

SWEETWATER VISTAS

HEC-RAS STUDY

FEBRUARY 2016

50' 0' 25' 50' 100'

SCALE: 1" = 50'

FUSCOE
ENGINEERING
6390 Greenwich Dr., Suite 170, San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335 ◦ www.fuscoe.com

F:\Projects\2780\002_Xbase\Object_Bases\HEC-RAS\HEC-RAS SECTIONS.dwg (2/18/2016 11:26 AM) Plotted by: Randy Roberts

ATTACHMENT 7

Copy of Project's Geotechnical and Groundwater Investigation Report

This is the cover sheet for Attachment 7.

If hardcopy or CD is not attached, the following information should be provided:

Title:
Prepared By:
Date:

This page was left intentionally blank.

SOIL AND GEOLOGIC INVESTIGATION

FOR

THE POINTE
UNIT I - RESORT AREA

SAN DIEGO COUNTY, CALIFORNIA

PREPARED FOR

POINTE BUILDERS

CHULA VISTA, CALIFORNIA

PREPARED BY

GEOCON INCORPORATED

SAN DIEGO, CALIFORNIA

AUGUST 1990

558-6900

GEOCON
INCORPORATED

Geotechnical Engineers and
Engineering Geologists

File No. 01687-03-07
August 3, 1990

Pointe Builders
3130 Bonita Road, Suite 200
Chula Vista, California 92010

Attention: Mr. Tom Henry

Subject: THE POINTE
UNIT I - RESORT AREA
SAN DIEGO COUNTY, CALIFORNIA
SOIL AND GEOLOGIC INVESTIGATION

Gentlemen:

In accordance with your request, our firm has performed a soil and geologic investigation for the subject project.

The accompanying report presents the findings of our investigation and presents our conclusions and recommendations relative to geotechnical aspects of the proposed site development.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

M.W. Hart
Michael W. Hart
CEG 706

Raul Garcia
Raul R. Garcia
RCE 42132

George Copenhaver Jr
George C. Copenhaver, Jr.
CEG 86

GCC:RRG:MWH:dmc

(14) addressee

REGISTERED PROFESSIONAL ENGINEER
RAUL R. GARCIA
NO. 42132
EXP. 3-31-92
CIVIL
STATE OF CALIFORNIA

REGISTERED GEOLOGIST
GEORGE C. COPENHAVER, JR.
NO. 86
CERTIFIED ENGINEERING GEOLOGIST
6-30-92
STATE OF CALIFORNIA

6960 Flanders Drive
San Diego, CA 92121-2974
619 558-6900
FAX 619 558-6159

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

SOIL AND GEOLOGIC INVESTIGATION

PURPOSE AND SCOPE

The purpose of our soil and geologic investigation was to provide updated geotechnical information for development of Unit I. Specifically, this report is intended to provide additional geologic and geotechnical design information for the Resort Area of The Pointe, Unit I, with respect to grading of the site, groundwater conditions, approximate depth and lateral extent of unsuitable materials, foundation design, slope stability analysis, rippability characteristics and other geotechnical information pertinent to the proposed development.

The scope of our investigation included a review of 1953 U. S. Government aerial photographs and pertinent published literature including the following:

- *Specific Plan for Hansen's Ranch Specific Planning*, prepared by Pointe Builders, dated March 9, 1990.
- *Plot Plan of County of San Diego, Tract No. 4828, Hansen Ranch Portions of Units 1 and 2*, Sheets 1 through 4, prepared by Pointe Builders, dated April 7, 1989.
- *Geology Report* and *Archaeological Survey for the Proposed La Presa Trunk Sewer*, prepared by the County of San Diego, Public Works Agency, dated November 8, 1974 and January 2, 1975, respectively.
- *Replacement Tentative Map of County of San Diego, Tract No. 4828, Hansen's Ranch, Units 1 through 18*, Sheets 1, 2, and 3, prepared by Pointe Builders, dated June 23, 1989.
- *Seismic Refraction Study for Hansen's Ranch* (File No. D-1687-M01), prepared by Geocon Incorporated, dated January 25, 1979.

- *Preliminary Soil and Geologic Reconnaissance* (File No. D-1687-M02), prepared by Geocon Incorporated, dated January 22, 1981.
- *Addendum to the Preliminary Soil and Geologic Reconnaissance*, (File No. D-1687-M02), dated December 1, 1981.
- *Soil and Geologic Investigation for the Pointe, Commercial Area*, (File No. D-3010-M02), prepared by Geocon Incorporated, dated April 27, 1984.

The field work consisted of geologic mapping by an engineering geologist from our firm, the excavation of 40 exploratory trenches, 6 large-diameter borings, 5 small-diameter borings and 9 shallow seismic traverses. Laboratory tests were performed on samples from the exploratory trenches and borings to determine physical characteristics of the soil types encountered. Details of our field exploration and laboratory tests are presented in Appendixes A and B, respectively. Slope stability calculations (Appendix C), along with geotechnical analyses of the findings of the field and laboratory investigation, as well as experience with similar soil and geologic conditions form the basis for the conclusions and recommendations that follow.

SITE AND PROJECT DESCRIPTION

The Pointe, Unit I, a proposed resort area, is located in the Spring Valley area of San Diego County, California. The area investigated is situated in the northern portion of the proposed development as indicated on Figure 1. The enclosed Geologic Map (Figure 2) shows the extent of the soil and geologic investigation relative to the proposed development of that area.

The area investigated is dominated by two converging southwestward-draining tributaries to the Sweetwater River, separated by Jamacha Boulevard and associated improvements. The drainage on the northwest side of Jamacha Boulevard drains developments of the Homeland area above the site, as well as the historical *Sweetwater Springs* within this same drainage. Drainage is impounded by two small earthen dams comprised of undocumented fill in the central portion of the area investigated. The drainage channel above the earth dams and associated ponds is narrow with steep sides. The two small ponds capture both the surface water and spring water in the northern portion of the site. Elevations within this drainage vary from 440 feet Mean Sea Level (MSL) adjacent to Sweetwater Springs Boulevard to 290 near the base of the convergent drainages at the southwestern corner of the site.

The drainage southeast of Jamacha Boulevard drains a small area northeast of the development. Within the area investigated, this drainage is contained within a relatively wide channel (50 to 100 feet wide) which converges with the above-described Sweetwater Springs drainage near the southern corner of Unit I.

Previous development in the area consists of structures associated with containment of the springs in the late 1800's, a small water storage and pump station associated with the Otay Water District, undocumented fills associated with the earthen dams, a large soil-boulder fill stockpile and adjacent roadways and developments along the margins of the property (see Figure 2).

It is our understanding that proposed development for the Unit I - Resort Area will consist of the construction of a four- and five-story hotel structure, several two-, three- and four-story structures to allow 698 suites, recreational facilities, restaurants, associated parking driveways, and an access bridge. Grading on Unit I will generate cuts and fills on the order of 50 and 70 feet in depth, respectively. The existing surface and spring water may also be utilized in the landscaping and design scheme for the property. Also, the existing earth-fill dams will be removed prior to site-development.

The locations and descriptions presented herein are based on above-referenced Grading Plans by Pointe Builders Corporation. If project details vary significantly from those presently planned Geocon Incorporated should be notified for review and possible revision of this report.

SOIL AND GEOLOGIC CONDITIONS

Six surficial soil types and two geologic formations were encountered during the investigation. The surficial deposits include undocumented fill, topsoil, surficial landslide debris, alluvium, slopewash, and terrace deposits. Formational deposits encountered include the Miocene-age Sweetwater Formation and the Jurassic-age Santiago Peak Volcanics. Each of the soil types and geologic formations encountered is discussed below:

Undocumented Fill (Qudf)

Areas of undocumented fill soil (Figure 2) were encountered capping areas in both the northern and southern portions of the site, as well as the areas along the two major roads (Jamacha and Sweetwater Springs Boulevards). Undocumented embankment fills were also encountered damming the two ponds in the central portion of the site.

Fills within the spring area (Figure 2) consisted of at least 8 feet of loose to medium dense, dry to saturated, light gray, clayey to gravelly, fine to coarse sand with some boulder-size concrete fragments and piles of imported gravel. Some wood, metal pipe, and culvert debris probably associated with early development of the spring was also encountered in the northern portion of the site.

Fills at least 3 feet in depth underlie Sweetwater Springs Boulevard and Jamacha Blvd. ~~Road~~ in the Otay Water Plant area. These fills, where observed, consisted of medium dense, dry, light brown to gray, clayey, fine to coarse sand with large boulder-size rock fragments (up to 4 feet diameter). The fill soils within the pond embankment, though not investigated, probably consist of gravel-sand-clay mixtures on the order of 35 feet deep. Imported stockpile-fill consisting of soft, sandy clays to loose, sandy, boulder gravels occupies a large area bordering the northwest side of the intersection of Sweetwater Springs Boulevard and Jamacha Road (see Figure 2). This material varies in moisture content from dry to wet with little or no apparent engineering control or compaction. Maximum depths encountered were on the order of 15 feet, but may exceed this in localized areas. All existing fill soils should be considered uncompacted and will require remedial grading and/or special consideration as recommended hereinafter.

Topsoil (not mapped)

Residually developed topsoils of relatively uniform thickness were observed on the sloping hillsides throughout the area investigated. The topsoils are characterized by approximately 1 to 2 feet of soft to stiff, dry, dark brown, sandy to gravelly clay, and are indistinguishable from slopewash soils and alluvium described in the following sections. As such, they require remedial grading measures described under the "Conclusions and Recommendations" section of this report.

Surficial Landslide Debris (Qlsf)

Two areas of surficial landsliding were mapped within sandy clays derived from and founded upon, Sweetwater Formation claystones in the northern and southern portions of the site (see Figure 2). The shallow landslide debris was encountered in exploration trenches numbered T-2 and T-5 in the northern portion, near the springs, and in T-30, T-33 and T-39 in the southern portion of the site. Surficial landslide materials, averaging approximately 10 feet thick, typically consisted of soft, wet, light olive, sandy clays that have failed along adversely-dipping clay seams within weak claystones of the Sweetwater Formation. These materials are relatively soft and unstable, possessing the potential for future movement. This will necessitate remedial grading measures to be discussed in the concluding sections of this report.

Alluvium (Qal)

Soils of alluvial origin were encountered within the lower elevations of drainages (Figure 2). The maximum thickness of alluvial materials encountered is on the order of 20 feet and occurs generally in the area of the active drainage channel as it crosses Jamacha Boulevard on the southern portion of the site. In general, the alluvial soils consist of soft to firm, moist to saturated, dark brown, organic-rich, gravelly to sandy clay with groundwater (trapped in the alluvium above the bedrock) at depths of 3 to 15 feet below present surface elevations.

Due to the unconsolidated and often-saturated condition of the alluvial soils, remedial grading measures will be necessary as described in the "Conclusions and Recommendations" section of this report.

Slopewash (Qsw)

The slopewash soil deposits are indistinguishable from alluvial or topsoil materials, but locally have developed as accumulations near the base of slopes as soft or loose dark brown sandy clays to clayey sands. Their maximum thickness, as encountered in trenches, is on the order of 4 to 5 feet (Trench No. T-38, Appendix A). The deepest slopewash should be anticipated along the southern portions of the site and along the base of slopes bordering canyons and gullies. As with other previously-described surficial deposits, the unconsolidated nature of slopewash deposits will require remedial grading as recommended hereinafter.

Terrace Deposits (Qt)

Dense, reddish-brown sandy cobble conglomerates were encountered along slopes west of the southern pond approximately between elevations 360 and 390 (MSL). Although not observed, cobbles and small boulders greater than 6 inches in diameter are common within such deposits and require placement as recommended in the concluding section of this report. The sandy portions of the Terrace Deposits exhibit very low expansive characteristics and may be suitable for capping building pads.

Sweetwater Formation (Tsw)

Stiff to hard, fractured claystones interbedded with clayey coarse-grained sandstones and sandy-clayey cobble-conglomerates comprise this Miocene-age unit at the site. The Sweetwater Formation was encountered in test excavations along the approximate center, and slightly southward, of the major northeast-to-southwest trending drainage below the Sweetwater Springs (see Geologic Map, Figure 2). The very irregular wedge-shaped depositional contact with an older bedrock unit and the presence of permeable fracture zones and conglomerate beds along the valley bottom may have caused entrapment and perching of groundwater which created the Sweetwater Springs.

The Sweetwater Formation's alternating claystone-conglomerate sequence will be exposed in the proposed 30 to 50-foot-high cut slopes along the northern margins of the site adjacent to Sweetwater Boulevard. Test excavations in the area of proposed cuts encountered from 25 to 35 feet of wet to saturated fractured claystones and cobble conglomerates (see Boring Nos. LB-1 and LB-2, Appendix A). Active zones of seepage (estimated at approximately 10 gallons per minute) were noted between approximate elevations 400 and 420 (MSL) and were typically strongest within conglomerate beds, but also occurred along remolded clay seams within claystone beds.

Typically, fractured claystones and remolded clay seams within the Sweetwater Formation exhibit low shear strength; therefore, slope stabilization measures will be required, as discussed in concluding sections of this report. In addition, the more clayey portions of this formations are highly expansive and will require selective grading or specially designed foundations as described hereinafter.

Santiago Peak Volcanics (Jsp)

Metavolcanic rocks of the Jurassic-age Santiago Peak Volcanics were encountered on the hillsides bordering the site, in the drainage bottom adjacent to the spring area and underlying the Sweetwater Formation at depth. These rocks typically consist of highly weathered, fractured, light reddish-brown, fine, strong, argillically altered andesitic tuffs or breccias. Away from the valleys on the higher slopes, the rock becomes less fractured and more massive.

Remnant bedding, or flow-banding, where exposed, has a strike of approximately N20E, and dips northwestward 37 degrees. Predominant joint planes have a near-vertical dip (80-90 degrees) with a strike varying from N80W to N40E. In the area of the spring, the upper 4 feet of the metavolcanic rock was less dense and extensively fractured. Because of an ancient northeast-to-southwest trending fault zone encountered in Trench Nos. T-8 and T-10, the volcanic bedrock is permeable and contributes significantly to the active water seepage along the major northeast-trending valley and the spring area itself.

These rocks typically display variable degrees of weathering and/or alteration. Excavation of relatively-fresh material often generates highly-fractured, sharp-edged rock fragments with some reddish-brown silty clay.

Proposed cut slopes along the western portion of the site were evaluated for depth of rippability by utilizing nine shallow refraction seismograph traverses (see Figure 2). Where excavations are planned within these slopes, marginal to non-rippable conditions that

Minor active water seepage, as well as groundwater trapped in the alluvium above the metavolcanic bedrock, was encountered in most of the surrounding drainages at, or below, the above-noted seepage elevations.

It is our understanding that it is proposed to collect most of the water from the springs and from the storm drain outlet located at the north boundary into the water treatment plant to be built at the site. This water will be used for landscape purposes. In addition, water that is intercepted by the proposed grading operations, will also be collected and utilized for landscaping. Recommendations with respect to the collection and subdrain system are discussed in the "Conclusions and Recommendations" section of the report.

GEOLOGIC HAZARDS

Faulting and Seismicity

A review of available geologic literature and our field reconnaissance indicates that there are no known active faults on the property or in the immediate vicinity. No indications of active faults were observed, nor did the field reconnaissance reveal evidence suggestive of active faulting. The ancient northeast-trending bedrock faults described above extend through the site. However, these faults and associated fractures do not appear to offset surficial deposits. Consequently, the potential for movement on this ancient fault or fracture system is considered very low to non-existent.

The nearest known active fault is the Elsinore Fault zone, which lies approximately 36 miles to the northeast. The Rose Canyon Fault, located approximately 10 miles southwest of the site, is currently the subject of research to determine the potential for seismic activity. It is our understanding that results of the ongoing research indicate movement has occurred along the Rose Canyon Fault during the Holocene Epoch (approximately the previous 11,000 years), and that the California Division of Mines and Geology is currently acting to include this fault within an Alquist-Priolo Special Study Zone.

The probability of the project area experiencing a locally-generated Magnitude 6 or greater earthquake during the projected project lifespan would appear to be low to moderate, based on present knowledge. It is our opinion that the site could be subjected to severe ground shaking in the event of a major earthquake along the Elsinore or other fault systems in the Southern California region. However, the seismic risk at this site is considered to be no greater than that of the surrounding developments or the greater Spring Valley area in general.

Soil Liquefaction Potential

Soil liquefaction is generally limited to granular soils located below the water table which are in a relatively loose, unconsolidated condition at the time of a large, nearby earthquake. Loose deposits beneath areas to be developed are to be removed and densified, and subdrains installed where required to reduce the possibility of a shallow groundwater condition developing in the future. Therefore, the risk of seismically-induced soil liquefaction at this site is considered remote.

CONCLUSIONS AND RECOMMENDATIONS

General

1. It is our opinion that the site can be developed as presently proposed provided the following recommendations are carefully followed.

2. As indicated by the exploratory trenches and borings, portions of the site are mantled by surficial compressible undocumented fill soils, topsoils, surficial landslide debris, alluvium and slopewash. Underlying these soils at different locations are Terrace Deposits, formational soils of the Sweetwater Formation and metavolcanic rocks of the Santiago Peak Volcanics. The fill soils, topsoils, surficial landslide debris, alluvium and slopewash materials are in an unsuitable condition to receive settlement-sensitive improvements, and will require remedial grading in the form of removal and recompaction.

3. It is anticipated that oversize rocks will be generated during grading of the Santiago Peak Volcanics, therefore, the grading operations should be carefully planned to place such rocks in a "rock fill" to be constructed in the deeper areas of fill. Rock fills should be constructed in the existing drainage canyon to a depth not exceeding one half the total depth of the fill. Figure 5, shows a detail for the construction of the rock fill. Appendix D includes the specifications for rock fills.

4. The construction of a drained buttress along the proposed cut slope parallel to Sweetwater Springs Boulevard and the northern portion of Jamacha Road is recommended. The approximate location and extent is indicated in Figure 2. Details for construction are included in the buttress construction section. It is anticipated that a considerable amount of water will be exposed in the cut slopes of the buttress. Details for the construction of the buttress drain are included in the "dewatering and subdrains" Section and Figures 10 and 11.

Soil and Excavation Characteristics

5. In our opinion, the fill soils, the majority of the Santiago Peak Volcanics, and the sandy soils of the Sweetwater Formation possess very low to medium expansive characteristics (Expansion Index less than 90). The clayey soils of the Sweetwater Formation and highly weathered near surface portions of the Santiago Peak Volcanics exhibit high expansive characteristics (Expansion Index greater than 90). The in situ soils in general possess satisfactory foundations support characteristics in a dense natural and/or properly compacted state.

6. It is anticipated that the alluvial soils and portions of the fill soils will require extensive drying and mixing due to their high moisture content.

7. It is anticipated that extensive sorting and cleaning of the existing fill soils will be required due to the presence of abundant deleterious debris such as wood, plastics. rubble, oversize pieces of concrete, etc. All deleterious debris should be exported off-site.

8. An interpretation of the data obtained from each of the seismic traverses performed is tabulated in Table I of Appendix A. The rippability terms are approximately correlated with a D-9 caterpillar dozer equipped with a single-shank ripper and are defined in Table I.

9. Based on the seismic studies and the exploratory borings performed with a B-50 drill rig, it is anticipated that excavations in excess of 4 to 6 feet in depth in the metavolcanic rock will require blasting. The construction of building foundations and the excavation for trenches for underground improvements within streets underlain by metavolcanic rock may require preblasting unless these areas are overblasted during mass-grading blasting operation. The blasted material should be replaced with granular, properly-compacted material. The depth of overblast should extend at least 5 feet below proposed grade on the building pads and to the bottom of the deepest trench for the street underground improvements. Utility trenches within building pads should also be overblasted where they extend to a depth in excess of 5 feet below pad grade.

Dewatering and Subdrains

10. It is anticipated that a relatively-high volume of water will be encountered during the grading operations in the north, northeast, and northwest areas of the site. In addition, a considerable amount of water is presently flowing into the property through the storm drain outlet located at the north property boundary. This water will be collected by the proposed storm drain system.

11. The dewatering to allow the construction of the buttress should be performed in two phases. The first phase should consist of collecting the water with the buttress drain along Jamacha Boulevard North to an outlet at the south end. The water at the north portion of the buttress parallel to Sweetwater Springs Boulevard should be intercepted and collected by the internal drain with an outlet near the proposed water treatment plant. Figure 10 and 11 depict construction details. In addition, we recommend the construction of a french drain system along the northwest area of Lot No. 56. The french drain system should have a gradient of at least 0.5 percent. The approximate location of the drain system is indicated in Figure 2. Construction details are indicated in Figure 6.

12. Additional subsurface dewatering drains, including local water wells and/or sumps, may also be required throughout the site, pending groundwater conditions encountered during field grading operations. It should be realized that the

groundwater level measures were taken after an exceptionally dry winter and these water levels could rise somewhat during years of higher precipitation.

13. All active seepage areas encountered in areas of proposed fills should be drained with water directed into a suitable discharge facility.

14. After all alluvium has been removed from the bottom of the canyons, a subdrain should be installed along the axis of the canyons. The lower 20 feet of the subdrain installation should consist of non-perforated pipe and a concrete cutoff wall should be constructed immediately below the junction of the perforated pipe with non-perforated pipe. The cutoff wall should extend at least 6 inches beyond the sides and bottom of the subdrain trench and 6 inches above the top of the pipe. After installation of the subdrain, the project civil engineer should survey its location and prepare accurate "as-built" plans of the subdrain location. The project civil engineer should verify the proper outlet for the canyon subdrains and the contractor should ensure that the drain system outlet is free of obstructions. The approximate locations of the subdrains are designated on Figure 2. Details for construction are indicated in Figure 7.

15. The heel drains installed in the buttress should be connected to the system that will collect the water for the treatment plant. Connections of heel drains to the outlets should also be verified by the project civil engineer.

Slope Stability

16. It is our opinion, based upon the findings of this investigation, that cut slopes excavated in the metavolcanic rocks of the Santiago Peak Volcanics should be stable with respect to deep-seated failure, if constructed at maximum inclinations of 1.5:1.0 to maximum heights of approximately 50 feet. However, the slopes may contain adversely-inclined fracture-surfaces and/or joints, therefore, it is recommended that all cut slopes be periodically observed during grading by an engineering geologist or soil engineer from this office to verify that the soil conditions encountered do not differ significantly from those assumed in our analysis. It is further our opinion that fill slopes, if constructed to a maximum inclination of 1.5:1.0, will likewise be stable with respect to deep-seated failure if constructed to maximum heights of approximately 45 feet. The analyses were performed utilizing a factor-of-safety of 1.5 under static loads. We recommend that slopes be planted with a light-weight, deep-rooted drought-tolerant ground cover to reduce the potential for erosion of the slopes. The maximum allowable slope height for the proposed fill slopes is presented on the Slope Design chart presented as Figure 8. Surficial stability calculations are included in Figure 9.

17. The fill slopes should be constructed with granular soils having an angle of internal friction of at least 35 degrees and a cohesion of at least 200 psf. These soils should be placed for a width along the face of the slope equal to the height of said slope. All soil fill slopes should be compacted by back-rolling at intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the completed slope. In lieu of back-rolling and track-walking the slope, it is recommended that consideration be given to overbuilding the slope by at least three feet and then trimming back the slope to a compacted core at finish grade. It has been our experience that proper compaction of the slope face is difficult to achieve with 1.5:1 fill slopes. In addition, they are susceptible to surficial erosion. Alternatively, rockfills instead of soil fills could be utilized to construct the slopes.

18. All slopes should be planted, drained and properly maintained to reduce erosion.

Buttress Construction

19. The results of the investigation indicate that relatively weak claystones of the Sweetwater Formation will be exposed in the cut slopes along Sweetwater Springs Boulevard and the north portion of Jamacha Boulevard North. The presence of remolded claystones encountered in exploratory large-diameter boring Nos. 1 and 2 and the results of slope stability analyses indicated that the proposed cut slopes will

have a factor-of-safety of less than 1.5. Therefore, it is recommended that a drained buttress fill be constructed at the location indicated on the Geologic Map, Figure 2. Typical buttress cross-sections are shown on Figures 10 and 11. The computer stability analysis and calculations for the buttress design are included in Appendix C.

20. The construction of the buttress along Sweetwater Springs Boulevard should be performed in two sections, each approximately 150 feet wide, due to anticipated unstable conditions caused by the presence of groundwater, remolded zones of clays and the proximity of the existing road.

21. The construction of the buttress and cut slopes should be observed by an engineering geologist during grading to verify that the soil and geologic conditions do not differ significantly from those anticipated. If adverse conditions are encountered, recommendations for slope stabilization can be presented at that time.

22. Temporary backcut slopes excavated during buttress and stability fill construction should be considered marginally stable due to the probable existence of weak materials within the Sweetwater Formation and the presence of groundwater. Therefore, some slope failures should be anticipated during backcut construction. Maximum slope inclination for temporary excavations should not exceed 1:1 (horizontal to vertical) to reduce the potential for construction slope failures. In

addition, water should not be allowed to discharge over the face of temporary slopes or to pond in areas above the slopes. We recommend the installation of at least two inclinometers along Sweetwater Springs Boulevard to monitor any lateral movement that may occur during the construction of the buttress.

Grading

23. The grading should be performed in conformance with the Grading Ordinance of the County of San Diego and the "Recommended Grading Specifications" presented in Appendix D herein. Where the recommendations of this portion of the report conflict with those of Appendix D, this section takes precedence. The earthwork should be observed by, and the compacted fill tested by, representatives of Geocon Incorporated

24. It is recommended that a preconstruction conference be held at the site with the owner or developed, grading contractor, civil engineer and geotechnical engineer in attendance. Special grading and/or the grading plans can be discussed at that time.

25. Site preparation should begin with the removal and exportation of all vegetation and other deleterious debris from the area to be graded. The depth of removal should be such that organic material is not present in soils to be placed as fill at the site.

Extensive sorting and screening of the existing fill soils to remove debris is anticipated if they are to be utilized as structural fill soils.

26. The alluvial soils and portions of the existing fill soils and formational soils contain excessive moisture and will require extensive drying and mixing with drier soils to facilitate proper compaction. Extensive discing of the saturated clayey soils with dry materials should be anticipated.

27. Due to the loose condition of the uncompacted fill soils, topsoils, surficial landslide debris, alluvium and slopewash materials overlying the project site, it is recommended that these soils be excavated in their entirety prior to receiving structural fill. The bottom of the excavation should be scarified, moisture conditioned as required and compacted to at least 90 percent relative compaction. The excavated material can than be placed and compacted in layers until final grade elevations are obtained. Layers of fill should be no thicker than will allow for proper bonding and compaction. Layers of 6 to 8 inches should be anticipated for this project.

28. The areas to receive structural rock fills should be cleaned in accordance with paragraph No. 27. The rock fill should be placed in accordance with the specifications presented in Appendix D.

29. Due to the very dense nature of the underlying Santiago Peak Volcanic rocks and the need to use blasting techniques to facilitate site grading, it is expected that a considerable amount of rock will be generated during the grading operations. The oversize rock should be incorporated and placed in accordance with Section 6 of the enclosed "Recommended Grading Specification" (Appendix D).

30. The rock fills should be constructed in the central major drainage canyon. The depth of the rock fill should not exceed one-half of the total depth of fill. The remainder of the fill should be composed of granular Disintegrated Granitic (D.G.) soil.

31. The upper half of the fill beneath the Grande Ballroom and the two four-story hotel structures should be composed of granular material (Disintegrated Granite) compacted to a relative compaction of at least 95 percent. The lateral extent of the select fill soil placement should extend beyond the building pad at least twice the depth of the total fill thickness (including the rockfill).

32. To reduce the potential for differential settlement, it is recommended that the cut portion of cut-fill transition pads be undercut at least 5 feet and replaced with properly-compacted Disintegrated Granite as discussed in paragraph 31.

33. The upper 3 feet of all building pads (cut or fill) and 24 inches in pavement areas should be composed of "very low" to "low" expansive soils. Highly expansive soils should be placed in the deeper fill areas and properly compacted. "Very low" to "low" expansive soils are defined as those soils that have an Expansion Index of 50 or less when tested in accordance with UBC Standard 29-2.

34. Prior to placement of fill on an existing slope steeper than 6:1 (horizontal to vertical) the existing slopes should be "benched" as recommended in the attached Grading Specifications, attached as Appendix D. The "benches" should be a minimum of 4 feet in height and have competent material (as determined by the soil engineer) exposed on the horizontal and near vertical faces of the "bench."

35. The remainder of the fill and backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D1557-78, Method A, C or D.

Foundations

36. The following preliminary foundations and concrete slab-on-grade recommendations assume that soils with an Expansion Index of less that 50 will be present within the upper 3 feet of finish grade.

One- and Two-Story Structures

37. The project is suitable for the use of continuous strip footing, isolated spread footings or appropriate combinations thereof. Continuous strip footings should be at least 12 inches wide and should extend at least 18 inches below lowest adjacent pad grade into dense formational soil or properly-compacted fill. Isolated spread footings should be at least 2 feet square and extend at least 18 inches below lowest adjacent pad grade into dense formational soil or properly-compacted fill.

38. It is recommended that minimum reinforcement for continuous footings consist of two No. 4 steel reinforcing bars placed horizontally in the footings, one near the top and one near the bottom. The steel reinforcement for isolated footings should be provided by the structural engineer.

39. The recommended allowable bearing capacity for foundations designed on compacted fill soils as recommended above is 2,000 psf. For foundations on dense natural meta-volcanic rock, an allowable soil bearing pressure of 4,500 psf can be used. This bearing capacity may be increased by additional 300 psf for each additional foot of depth and an additional 200 psf for each additional foot of width to a maximum allowable bearing capacity of 10,000 psf. The values presented above are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

Three- and Four-Story Structures

40. For three- and four-story structures, the continuous footings should have a minimum depth of 24 and 36 inches, respectively. The minimum width should be at least 12 inches. Isolated spread footings should be at least 2.5 feet square and should extend at least 24 inches below lowest adjacent pad grade into dense formational soil or properly-compacted fill.

41. It is recommended that minimum reinforcement for continuous footings consist of four No. 5 steel reinforcing bars placed horizontally in the footings, two near the top and two near the bottom. The steel reinforcement for the isolated footings should be provided by the structural engineer.

42. The recommended allowable bearing capacity for foundations on fill soils designed as recommended above is 3,500 psf. For foundations entirely on dense natural metavolcanic rock, an allowable soil bearing pressure of 6,000 psf may be used. This bearing capacity can be increased an additional 500 psf for each additional foot of depth and an additional 250 psf for each additional foot of width, to a maximum allowable bearing capacity of 10,000 psf. The values presented above are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

43. The recommended dimension and steel reinforcement presented above are based on soil characteristics only and are not intended to be in lieu of reinforcement necessary to satisfy structural loading.

44. Foundations adjacent to slopes should possess a minimum horizontal distance of 7 feet measured from the low outside edge of the foundation to the face of the adjacent slope.

45. The footing excavations should be observed by a representative of Geocon Incorporated prior to placing reinforcing steel or concrete.

46. Final foundation recommendations for the structures should be provided after the grading operations are completed and the precise location and configuration of the proposed structures have been determined.

47. As an alternative to the foundation recommendations presented above, consideration should be given to the use of post-tensioned concrete slabs and foundation systems for support of the proposed structures. If used, the post-tensioned systems should be designed by a structural engineer experienced with such foundation systems.

48. The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential settlement of deep fills or fills of varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations and slabs-on-grade placed on such conditions may still exhibit some cracking. The occurrence of concrete shrinkage cracks are independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, and in particular, where re-entry slab corners occur.

Slab-On-Grade Construction

49. Concrete slabs-on-grade should be at least 4 inches thick and should be underlain by at least 4 inches of clean sand (minimum Sand Equivalent of 20). Slabs subject to vehicular loads should be at least five inches thick. Where moisture-sensitive floor coverings are planned, the slabs should also be underlain by a visqueen moisture barrier. At least 2 inches of the sand bedding should be placed above the visqueen to assist concrete curing.

50. Slab reinforcement should consist of at least 6x6-6/6 welded wire mesh throughout. It has been our experience that the mesh must be physically pulled up into the slab after the placement of concrete. Reinforcement for slabs subject to vehicular traffic

should also consist of at least 6x6-6/6 welded wire mesh. The mesh should be positioned within the upper one-third of the slab. Proper mesh positioning is critical to future performance of the slabs.

Settlement

51. It is anticipated that the structures founded entirely on formational soils will experience a maximum ultimate differential settlement of less than 0.75 inches. For structures situated on fill areas, it is estimated that the ultimate settlement will be on the order of 0.3 percent of the total depth of the fill. Maximum anticipated differential settlement can be estimated for individual structures by estimating fill depths beneath building corners and multiplying the differential fill thickness by 0.003.

Retaining Walls

52. Retaining wall foundations should conform to the recommendations under Items 37, 38 and 39. The footings should be founded in dense formational material or properly compacted fill.

53. Active earth pressures against walls will depend on the slope of backfill and degree of wall restraint. Unrestrained walls with horizontal, properly drained backfill should be designed to resist an active earth pressure equivalent to that generated by a fluid weighing 30 pcf. For rigid, absolutely restrained walls, a uniform horizontal pressure

of 7H psf (where H equals the height of wall in feet) should be added to the above loading.

54. The above recommendations assume level, properly drained granular backfill with no surcharge. For 2.0 horizontal to 1.0 vertical sloping backfill, an active pressure equivalent to that exerted by a fluid weighing 42 pcf should be assumed. For 1.5 horizontal to 1.0 vertical sloping backfill, an active pressure equivalent to that exerted by a fluid weighing 55 pcf should be assumed. For restrained retaining walls with sloping backfill, an additional uniform horizontal pressure of 7H psf (where H equals the height of the wall in feet) should also be added to the loading diagram. If vehicles are to be parked or driven adjacent to the top of retaining walls, a surcharge equal to 2 feet of soil should be added to the design wall loads.

55. Retaining walls should be properly waterproofed and provided with gravel and perforated pipe drain systems to reduce potential for hydrostatic pressure buildup behind walls. Special attention should given to the basement parking of the Grande Ballroom. Drainage for walls for this structure, if it is to be drained by gravity, may have to be connected to deeper storm drains. Figure 12 depicts details of retaining wall drainage. Alternatively, the use of prefabricated drainage boards, such as miradrain 3000 or equivalent product, may be substituted for the rock and filter fabric envelope.

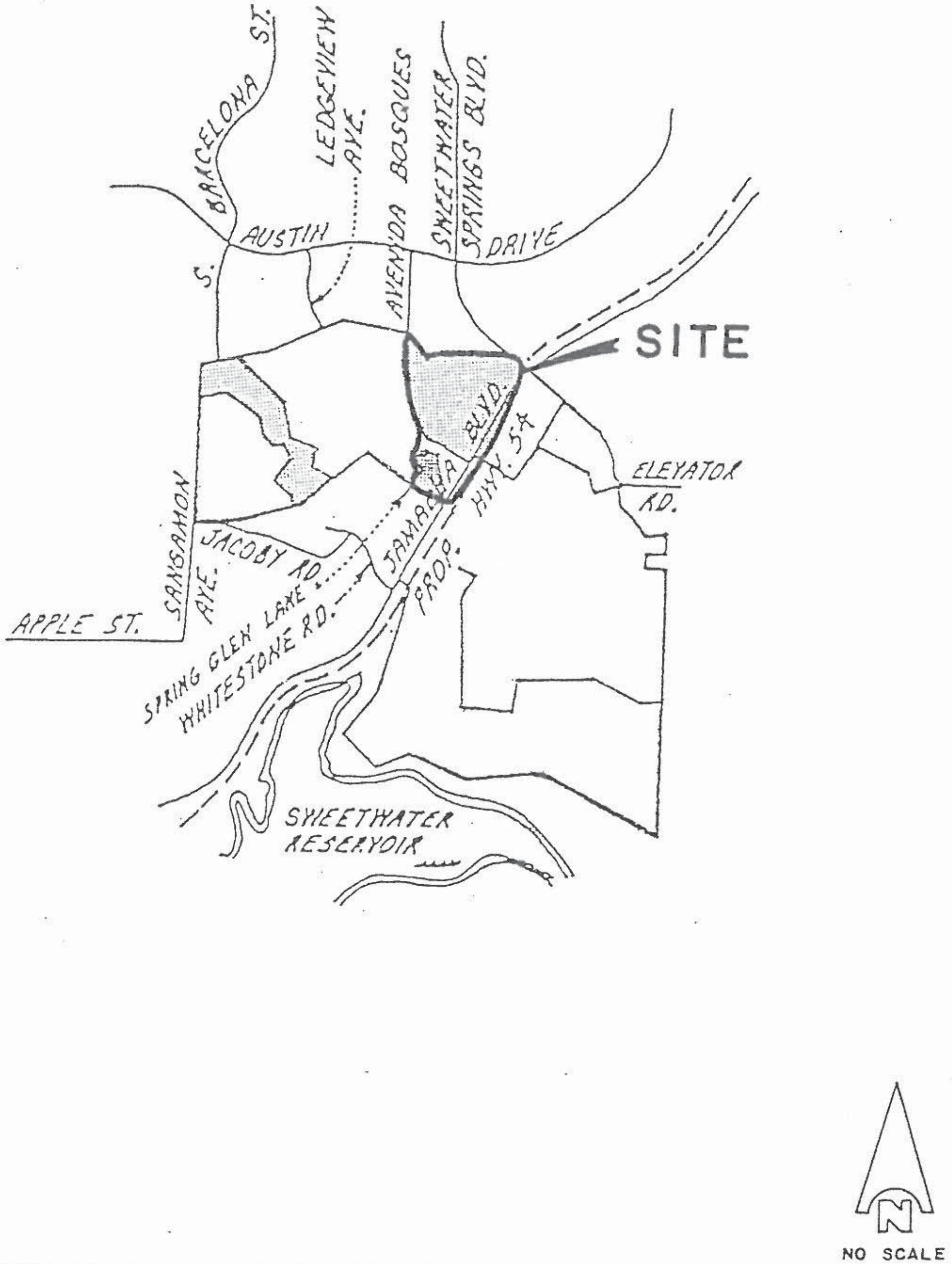
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

File No. 01687-03-07

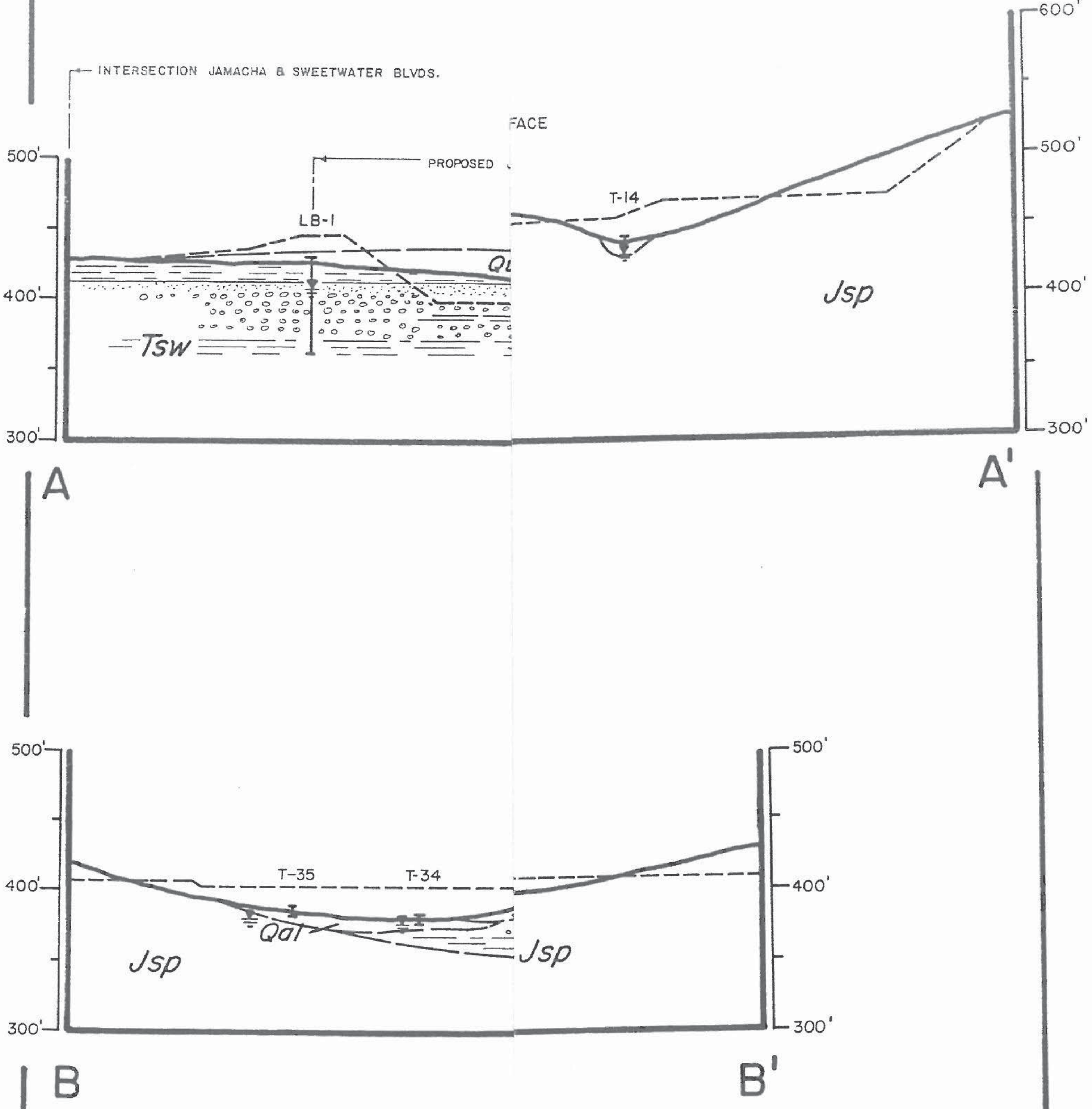


VICINITY MAP

THE POINTE
UNIT 1 - RESORT AREA
SAN DIEGO COUNTY, CALIFORNIA

Figure 1

THE POINTE



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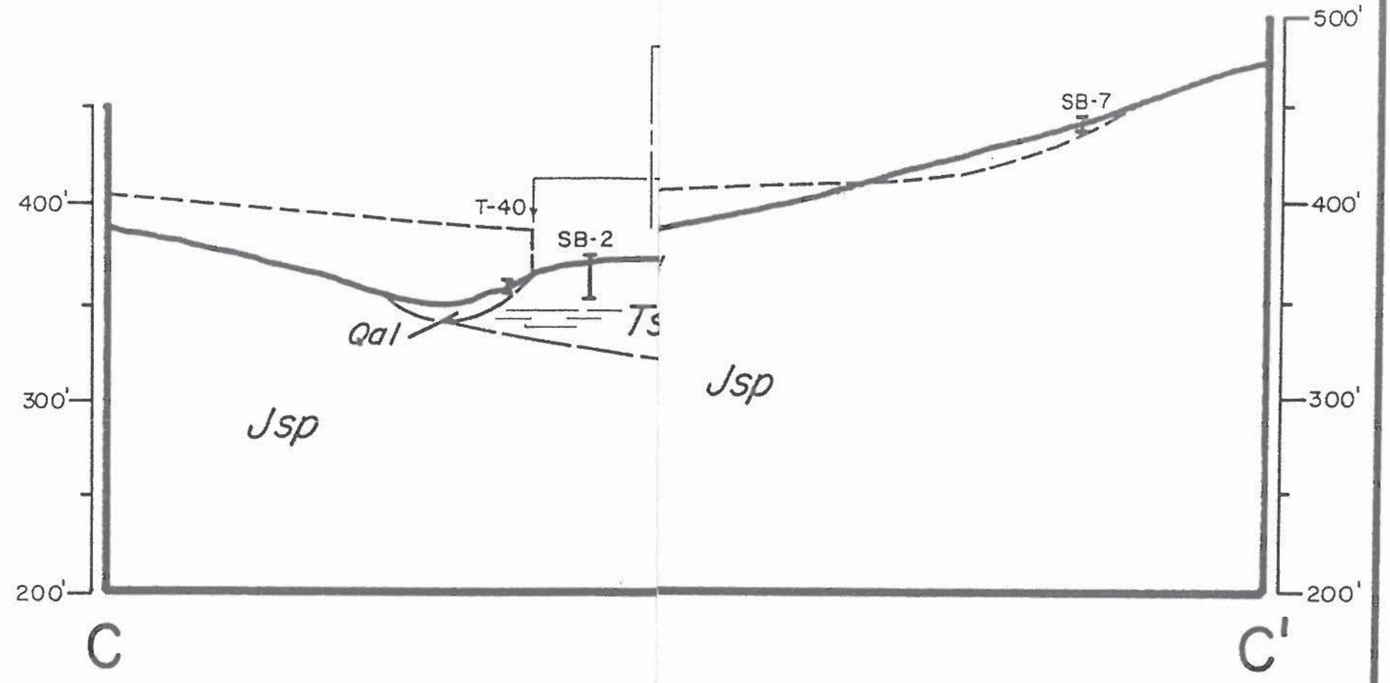
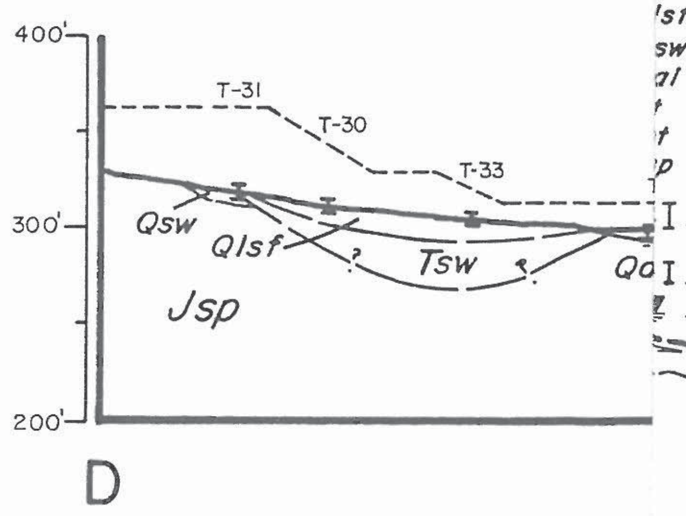
FILE NO. 01687-03-07

FIG. 3

DATE 8-3-1990

THE POINTE





LEGEND

udf ---- UNDOCUMENTED FILL
'sf ---- SURFICIAL LANDSLIDE DEBRIS
sw ---- SLOPEWASH
al ---- ALLUVIUM
---- TERRACE DEPOSIT
t ---- SWEETWATER FORMATION
p ---- SANTIAGO PEAK VOLCANICS
I ------ APPROX. LOCATION OF SMALL-DIAMETER & LARGE-DIAMETER BORING
I ------ APPROX. LOCATION OF TEST TRENCH
------ GROUNDWATER/SEEPAGE
---- FAULT
---- GEOLOGIC CONTACT

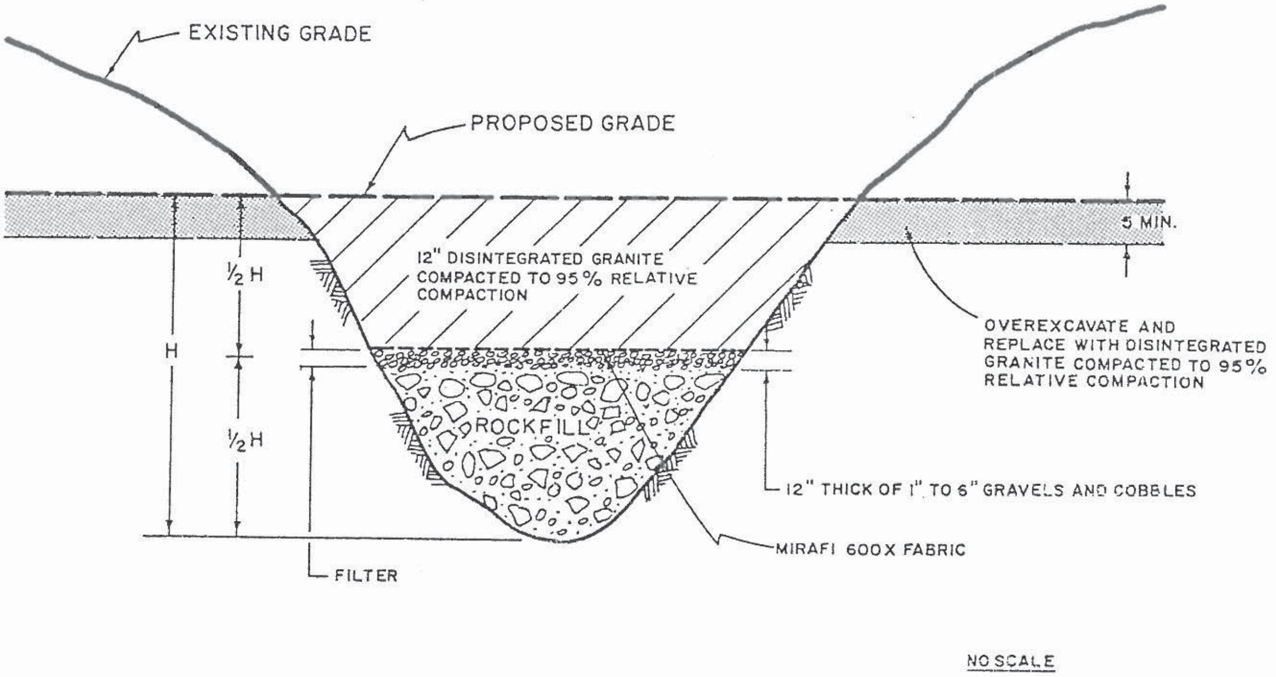
GEOCON
INCORPORATED

GEOTECHNICAL ENGINEERS AND ENGINEERING GEOLOGISTS
6960 FLANDERS DRIVE — SAN DIEGO, CALIFORNIA 92121-2974
PHONE 619 558-6900 — FAX 619 558-6159

FILE NO. 01687-03-07

FIG. 4

D-D' DATE 8-3-90



ROCKFILL AND FILTER CONSTRUCTION DETAIL

THE POINTE
UNIT I - RESORT AREA
SAN DIEGO COUNTY, CALIFORNIA

Figure 5

FILE NO. 01687-03-07

TRENCH T 13

ELEVATION 472 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				GC	**UNDOCUMENTED FILL** Loose, dry-damp, medium brown, very Clayey boulder <u>GRAVEL</u>			
6				CL	**ALLUVIUM** Soft, moist, dark brown, Sandy-Gravelly <u>CLAY</u>			
8					**SANTIAGO PEAK VOLCANICS** Moderately weathered, fractured, medium brown-olive, fine, strong, slightly argillized <u>ANDESITIC TUFF</u>			
					TRENCH TERMINATED 8 AT FEET REFUSAL			

Figure A-25, Log of Test Trench T 13

POINT

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 14

ELEVATION 441 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, wet dark brown, Silty fine SAND; some clay			
2				SM				
4					Becomes wet to saturated, more clayey at 4 feet			
6				SM-SC				
			▼		Strong seepage at 7 feet			
8					**SANTIAGO PEAK VOLCANICS** Moderately weathered, fractured, dark orange mottled, with brown, fine, strong, argillized ANDESITIC TUFF			
10					TRENCH TERMINATED AT 10 FEET REFUSAL			

Figure A-26, Log of Test Trench T 14

POINT

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	▨ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

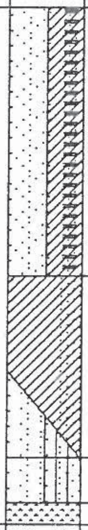
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 15

ELEVATION 428 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**UNDOCUMENTED FILL** Loose, damp to dry, medium brown, Bouldery-Clayey SAND			
6				CL	**SLOPEWASH** Soft, moist, dark gray-brown, Sandy CLAY Irregular depositional contact at 10 feet			
10				SM	**SWEETWATER FORMATION** Dense, damp light tan-white, Silty medium SAND			
					SANTIAGO PEAK VOLCANICS Moderately weathered, fractured, medium brown-olive, fine, strong, ANDESITIC TUFF			

TRENCH TERMINATED AT 11.5 FEET
NEAR REFUSAL

Figure A-27, Log of Test Trench T 15

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
▥ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▽ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 16

ELEVATION 338 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**ALLUVIUM** Soft, wet, dark-gray brown, Sandy CLAY			
2		▨						
4		░▨	▼	SC	**SWEETWATER FORMATION** Dense, saturated, light brown-olive, clayey fine SANDSTONE; random fracturing 2 to 6 inch spacing Strong seepage (along fractures) at 5 feet			
6		░▨						
8		░▨						
10					TRENCH TERMINATED AT 10 FEET			

Figure A-28, Log of Test Trench T 16

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 17

ELEVATION 370 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4 6	T17-1 ▨ T17-2 ☒			GM	**TERRACE DEPOSIT** Dense, damp, medium reddish-brown, Clayey-Sandy, cobble GRAVEL; partially cemented, some silt Horizontal depositional contact at 7 feet		124.9	4.4
8 10	T17-3 ▨ T17-4 ☒			CH	**SWEETWATER FORMATION** Stiff, moist-wet, light olive-brown, Silty CLAYSTONE; random clay seams and fractures		106.8	15.7
					TRENCH TERMINATED AT 11 FEET			

Figure A-29, Log of Test Trench T 17

POINT

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

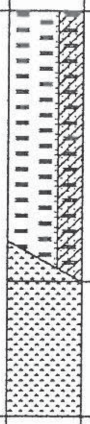
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 18

ELEVATION 380 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				GC	**ALLUVIUM** Stiff, damp, dark yellow-brown, very Clayey-Sandy cobble GRAVEL Irregular "V"-shaped depositional contact at 6 feet			
6 8				GC	**SANTIAGO PEAK VOLCANICS** Highly weathered, fractured, light orange-brown, fine, strong, argillized ANDESITIC TUFF; excavates to a very very clayey gravel; subparallel ENE trending close-spaced fractures			

TRENCH TERMINATED AT 9 FEET
NEAR REFUSAL

Figure A-30, Log of Test Trench T 18

POINT

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 19

ELEVATION 308 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**ALLUVIUM** Soft wet to saturated, dark gray-brown, Sandy CLAY scattered gravel			
2		▨						
4		▨						
6		▨	▼		Water table at 6 feet			
8		▥		SM-SC	**SWEETWATER FORMATION** Dense, saturated, light green to tan, Silty-Clayey very coarse (gritty) SANDSTONE			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-31, Log of Test Trench T 19

POINT

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

▨ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

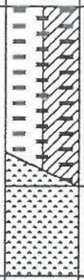
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 20

ELEVATION 378 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				GC	**ALLUVIUM** Stiff, damp, dark brown, very Clayey cobble GRAVEL			
2								
4					Irregular "V"-shaped depositional contact at 4 feet			
6					**SANTIAGO PEAK VOLCANICS** Highly weathered, fractured, medium orange-brown, fine, strong, argillized ANDESITIC TUFF; fractures 1/2 to 1 inch part in random patterns.			

TRENCH TERMINATED AT 6 FEET
REFUSAL

Figure A-32, Log of Test Trench T 20

POINT

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▽ ... WATER TABLE OR SEEPAGE

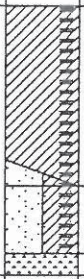
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 21

ELEVATION 355 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CL	**ALLUVIUM** Stiff, damp, dark brown, gravelly CLAY			
2								
4					Irregular depositional contact at 4 feet			
				SC	**TERRACE DEPOSIT** Very dense, damp, dark reddish-brown very Gravelly-Clayey SAND			
6					**SANTIAGO PEAK VOLCANICS** Moderately weathered, slightly fractured, medium gray-brown, fine, strong argillized, ANDESITIC TUFF			
					TRENCH TERMINATED AT 6 FEET REFUSAL			

Figure A-33, Log of Test Trench T 21

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 22

ELEVATION 370 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**SLOPEWASH** Loose, damp, dark brown, Silty-Clayey fine <u>SAND</u>; some gravel			
2					**SANTIAGO PEAK VOLCANICS** Highly weathered, highly fractured, light reddish-brown, fine, weak to moderate, argillized <u>ANDESITIC TUFF</u>; sheeted fractures predominantly N80W, 45SW, but vary in northern quadrants; occasional low-angle clay seams			
4								
6								
8					Becomes wet at 9 feet			
10					Becomes strong at 11 feet			
12					TRENCH TERMINATED AT 12 FEET			

Figure A-34, Log of Test Trench T 22

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 24

ELEVATION 363 DATE COMPLETED 6/6/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**SLOPEWASH** Soft, moist, dark brown, Sandy <u>CLAY</u>			
2	T24-1 ▨ T24-2 ☒			SC	**SWEETWATER FORMATION** Dense, moist, light tan-olive, Clayey medium to coarse <u>SANDSTONE</u>		74.4	32.6
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-36, Log of Test Trench T 24

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

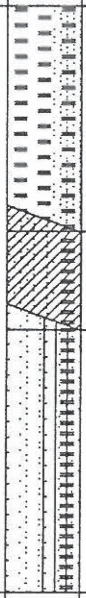
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 25

ELEVATION 407 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				GM	**UNDOCUMENTED FILL** Loose, dry, medium brown, Sandy Boulder GRAVEL; recent 6/5/90 toe of end-dump fill			
6				CL	**SLOPEWASH** Stiff, moist, dark brown, Sandy-Gravelly CLAY			
8 10 12				SM	**SWEETWATER FORMATION** Very dense, moist, light brown, very gravelly, very coarse (grit) Silty SAND Becomes more dense at 12 feet			
					TRENCH TERMINATED AT 13 FEET NEAR REFUSAL			

Figure A-37, Log of Test Trench T 25

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 26

ELEVATION 342 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**ALLUVIUM** Soft, moist to wet, dark gray-brown, Sandy <u>CLAY</u>			
2		▨						
4		▨						
6		▨		SC	**SWEETWATER FORMATION** Dense, wet to saturated, light green-tan, Clayey medium to coarse <u>SANDSTONE</u>			
8		▨						
10		▨	▼		Water table at 10 feet			
12					TRENCH TERMINATED AT 12 FEET			

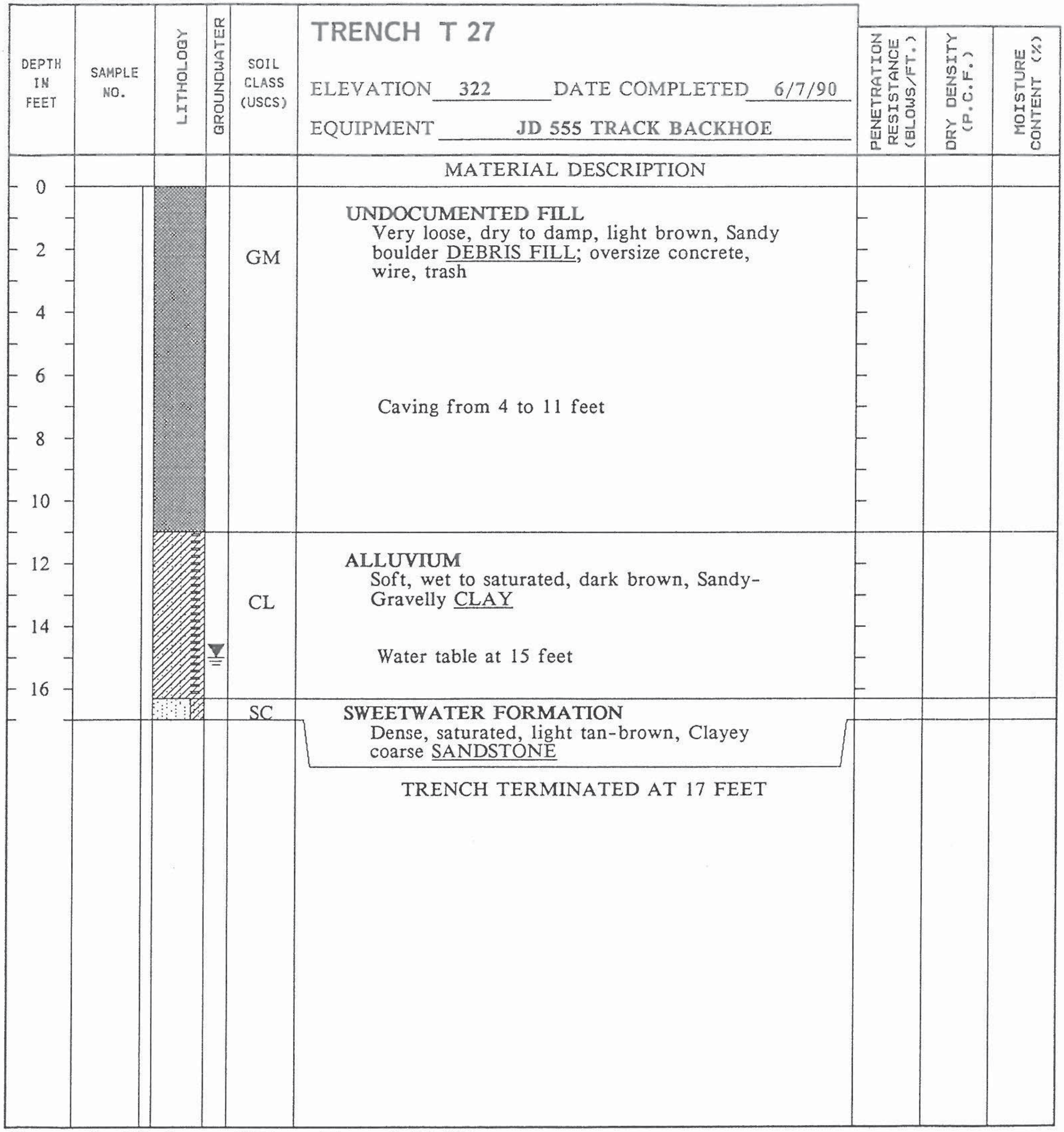
Figure A-38, Log of Test Trench T 26

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07



TRENCH T 27

ELEVATION 322 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

MATERIAL DESCRIPTION

UNDOCUMENTED FILL
Very loose, dry to damp, light brown, Sandy boulder DEBRIS FILL; oversize concrete, wire, trash

Caving from 4 to 11 feet

ALLUVIUM
Soft, wet to saturated, dark brown, Sandy-Gravelly CLAY

Water table at 15 feet

SWEETWATER FORMATION
Dense, saturated, light tan-brown, Clayey coarse SANDSTONE

TRENCH TERMINATED AT 17 FEET

Figure A-39, Log of Test Trench T 27

POINT

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	▨ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 28

ELEVATION 301 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GM	**UNDOCUMENTED FILL** Loose, damp, medium brown, Sandy boulder GRAVEL			
2								
4	T28-1 ⊠			CL	**ALLUVIUM** Soft, wet, dark gray-brown, Sandy-Gravelly CLAY			
6								
8					Becomes saturated at 8 feet			
10			▼		Water table at 11 feet			
12				CL	Soft to stiff, saturated, dark reddish-brown Sandy CLAY			
14								
					TRENCH TERMINATED AT 15 FEET			

Figure A-40, Log of Test Trench T 28

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 29

ELEVATION 291 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4 6		▨	▼	CL	**ALLUVIUM** Soft, wet, dark brown, Sandy <u>CLAY</u> Water table at 6 feet			
8		▩			**SANTIAGO PEAK VOLCANICS** Moderately weathered, fractured, dark green-brown, fine strong, argillized <u>ANDESITIC TUFF</u>			

TRENCH TERMINATED AT 8 FEET
REFUSAL

Figure A-41, Log of Test Trench T 29

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 30 ELEVATION 314 DATE COMPLETED 6/7/90 EQUIPMENT JD 555 TRACK BACKHOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0								
2				SC	**SURFICIAL LANDSLIDE DEBRIS** Loose, moist, medium brown, mottled with tan, very Clayey-Gravelly SAND			
4								
6								
8								
10				CL	Irregular disturbed contact; inclined northward approximately 10 degrees at 10 feet			
12					**SWEETWATER FORMATION** Hard, moist, medium light-olive, Silty-Sandy CLAYSTONE; highly fractured, with random slickensided clay seams			
					TRENCH TERMINATED AT 12 FEET			

Figure A-42, Log of Test Trench T 30

POINT

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	▨ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 31

ELEVATION 328 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				CL	**SLOPEWASH** Soft, moist, dark brown, Sandy CLAY			
4 6 8 10				CL	**SANTIAGO PEAK VOLCANICS** Totally weathered, highly fractured, light olive-brown mottled, fine, weak, strongly argillized ANDESITIC TUFF; almost a brecciated texture, with numerous random clay seams			
12					TRENCH TERMINATED AT 12 FEET			

Figure A-43, Log of Test Trench T 31

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 32

ELEVATION 306 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–6				CL	**ALLUVIUM** Soft, wet, dark brown to olive, Sandy-Gravelly CLAY			
6			▼		Strong seepage at 6 feet			
6–14				SC	**SWEETWATER FORMATION** Dense, saturated, light green, Clayey-Gravelly coarse SANDSTONE; randomly fractured with water-filled fractures			
14					TRENCH TERMINATED AT 14 FEET			

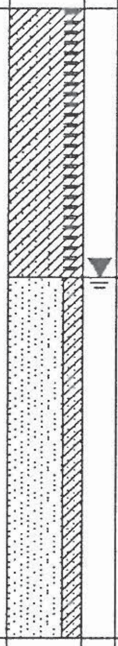


Figure A-44, Log of Test Trench T 32

POINT

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 33

ELEVATION 296 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨						
2		▨		CL	**SURFICIAL LANDSLIDE DEBRIS** Soft, moist, medium olive mottled with brown, white, Sandy-Gravelly CLAY			
4		▨			Becomes wet, random slicken sided clay seams common at 4 feet			
6		▨						
8		▤		GM	Dense, moist, medium brown, Sandy cobble GRAVEL; some clay			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-45, Log of Test Trench T 33

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 34

ELEVATION 374 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨						
2		▨		CL	**ALLUVIUM** Soft, wet to saturated, dark gray-brown Sandy CLAY			
4		▨	▼		Water table at 3.5 feet			
6		░			**SANTIAGO PEAK VOLCANICS** Moderately weathered, fractured, brown-olive, fine, strong ANDESITIC TUFF			

TRENCH TERMINATED AT 6 FEET
REFUSAL

Figure A-46, Log of Test Trench T 34

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

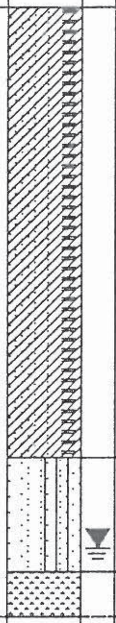
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 35

ELEVATION 382 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL	**ALLUVIUM** Stiff, moist, dark reddish-brown, Sandy-Gravelly CLAY			
4								
6								
8								
10				SM	Medium dense, moist, medium brown, Silty fine SAND Strong seepage at 12 feet			
12			▼					
					SANTIAGO PEAK VOLCANICS Moderately weathered, fractured, medium olive, fine, strong ANDESITIC TUFF			

TRENCH TERMINATED AT 13.5 FEET
REFUSAL

Figure A-47, Log of Test Trench T 35

POINT

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◨ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 36

ELEVATION 410 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2		▨		CL	**ALLUVIUM** Soft, saturated, dark gray-brown, Sandy <u>CLAY</u>			
4			▼		Water table at 4 feet			
					SANTIAGO PEAK VOLCANICS Moderately weathered, fractured, medium olive, fine, strong <u>ANDESITIC TUFF</u>			

TRENCH TERMINATED AT 5 FEET
REFUSAL

Figure A-48, Log of Test Trench T 36

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

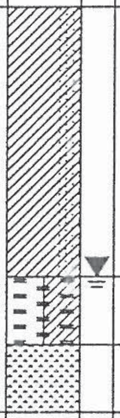
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 37

ELEVATION 406 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL	**ALLUVIUM** Soft, wet, dark brown, Sandy CLAY			
4								
6			▼		Water table at 6 feet			
				GC	Stiff, saturated, medium brown, Clayey boulder cobble GRAVEL			
8					**SANTIAGO PEAK VOLCANICS** Moderately weathered, fractured, medium brown fine, strong ANDESITIC TUFF			

TRENCH TERMINATED AT 9 FEET
REFUSAL

Figure A-49, Log of Test Trench T 37

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 38

ELEVATION 316 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				CL	**SLOPEWASH (OR CREEP)** Stiff, moist, dark brown, Sandy CLAY			
4					Sharp, thin remolded layer (on top of claystone at 4 feet			
6				CH	**SWEETWATER FORMATION** Stiff, wet, light green, Silty CLAYSTONE; highly fractured with slickensided clay seams			
					SANTIAGO PEAK VOLCANICS Moderately weathered, fractured, medium brown, fine strong, ANDESITIC TUFF			

TRENCH TERMINATED AT 6.5 FEET
REFUSAL

Figure A-50, Log of Test Trench T 38

POINT

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▽ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 39

ELEVATION 304 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**LANDSLIDE DEBRIS** Stiff, damp, dark brown, Sandy-Gravelly CLAY			
				CL	Soft, wet, medium-light greenish-brown, mottled with red, Silty, Sandy CLAY; "mixed" texture Random slickensided clay seams from 9 to 11 feet Dense, reddish-brown layer of volcanic clasts (disturbed) from 12 to 13 feet Remolded, slickensided clay seam N20W, 12SW approximately 1/4 inch thick at 14 feet			
14	T39-1 ☒							
				CL	Stiff to hard, medium olive, Silty CLAY; highly fractured; random slickensided clay seams			
16								

TRENCH TERMINATED AT 16 FEET

Figure A-51, Log of Test Trench T 39

POINT

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

▨ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

FILE NO. 01687-03-07

TRENCH T 40

ELEVATION 356 DATE COMPLETED 6/7/90

EQUIPMENT JD 555 TRACK BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM-SC	**UNDOCUMENTED FILL** Loose, dry, whitish-tan, Silty-Clayey medium SAND			
2								
4					Irregular contact at 4 feet			
				SC	**ALLUVIUM** Loose wet to saturated, dark brown, very Clayey coarse SAND; scattered gravel			
6								
			▼		Strong seepage at 8 feet			
8				GM	Loose, saturated, medium brown Sandy boulder GRAVELS; boulders to 2 inch diameter			
10								
12								
			▽		Seepage at 14 feet			
14				GM-SM	**SWEETWATER FORMATION** Medium dense, saturated, light brown, Sandy boulder GRAVEL to gravelly silty coarse SANDSTONE; near contact with Santiago Peak Volcanics			

TRENCH TERMINATED AT 15 FEET
NEAR REFUSAL

Figure A-52, Log of Test Trench T 40

POINT

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
▨ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

TABLE A-I

Seismic Traverses

Seismic Traverse No.	Velocity (ft/sec) V 1	V 2	V 3	Depth (ft) D 1	D 2	Length of Traverse (feet)	Approx Max. Depth Explored (feet +/-)
S-1	1310	6580	-	2	-	100	30
S-2	880	6320	-	2	-	100	30
S-3	970	7870	-	3	-	100	30
S-4	1360	4230	-	4	-	100	30
S-5	1310	4600	-	5	-	100	30
S-6	1270	6880	-	4	-	100	30
S-7	990	5990	-	3	-	100	30
S-8	1430	5200	-	5	-	100	30
S-9	1090	6350	-	4	-	100	30

V_1 = Velocity in feet per second of first layer of materials

V_2 = Second layer velocities

V_3 = Third layer velocities

D_1 = Depth in feet to base of first layer

D_2 = Depth to base of second layer

NOTE:

For mass grading, materials with velocities of less than 4500 fps are generally rippable with a D9 Caterpillar Tractor equipped with a single shank hydraulic ripper. Velocities of 4500 to 5500 fps indicate marginal ripping and blasting. Velocities greater than 5500 fps generally require pre-blasting. For trenching, materials with velocities less than 3800 fps are generally rippable depending upon the degree of fracturing and the presence or absence of boulders. Velocities between 3800 and 4300 fps generally indicate marginal ripping, and velocities greater than 4300 fps generally indicate non-rippable conditions. The above velocities are based on a Kohring 505.

The reported velocities represent average velocities over the length of each traverse, and should not generally be used for subsurface interpretation greater than 100 feet from a traverse.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures.

Selected relatively undisturbed drive samples were tested for their in-place dry density, moisture content, drained shear strength and consolidation characteristics.

The maximum dry density and optimum moisture content of selected disturbed bulk samples were determined in accordance with ASTM D1557-78, Methods A and C. Portions of the bulk samples were subjected to direct shear and Expansion Index tests.

The results of our laboratory tests are included in tabular and graphical form herewith.

TABLE I

Summary of Compaction Test Results

ASTM D1557-78, Method A

Sample No.	Description	Maximum Dry Density pcf	Optimum Moisture % Dry Wt.
T 2-2	Gray-brown, Sandy CLAY	102.7	18.8
T 10-3	Gray-brown, fine to coarse grained SAND	117.0	11.6
T 28-1	Very dark gray-brown, Silty Sandy CLAY	117.8	13.7
LB 6-2	Olive, fine to medium grained Silty SAND	106.8	18.8

TABLE II

Summary of In-Place Moisture-Density and Direct Shear Testing Results

Sample No.	Dry Density pcf	Moisture Content %	Unit Cohesion psf	Angle of Shear Resistance Degrees
T 10-3	105.1	11.7	230	29
LB 1-3*	86.7	34.1	50	8
LB 2-1	106.2	18.3	470	46
LB 3-1	88.9	29.2	680	42
LB 6-2**	96.2	18.8	160	40
LB 6-3	100.8	22.1	600	45
LB 6-6	111.2	17.1	450	42

---

* Residual Shear Test

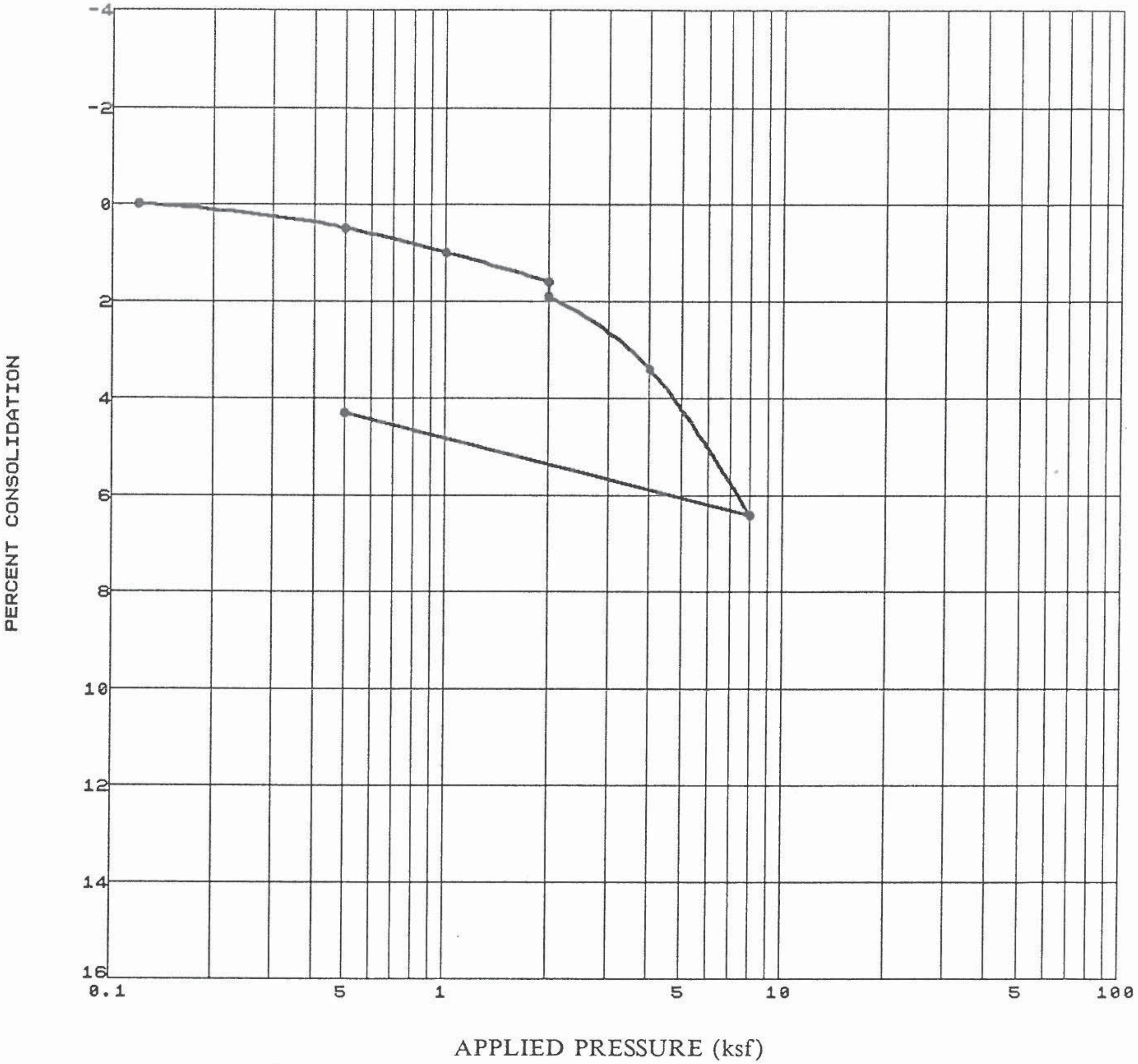
** Sample remolded to approximately 90 percent of maximum dry density at near optimum moisture content.

TABLE III

Summary of Expansion Index Test Results

Sample No.	Moisture Content Before Test %	Moisture Content After Test %	Dry Density Pcf	Expansion Index	Potential	Soil Type
T 2-2	16.0	40.7	91.4	105	High	Sweetwater Formation
T 10-3	11.8	32.8	102.4	83	Medium	Santiago Peak Formation
T 17-2	9.5	19.4	112.1	13	Very Low	Fill Soil
T 24-1	16.1	37.8	90.1	31	Low	Sweetwater Formation

SAMPLE NO. SB5-1



Initial Dry Density (pcf)	94.6
Initial Water Content (%)	23.2

Initial Saturation (%)	82.5
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

THE POINTE
UNIT I - RESORT AREA
SAN DIEGO COUNTY, CALIFORNIA

Figure B-1

APPENDIX C

File No. 01687-03-07
August 3, 1990

APPENDIX C

SLOPE STABILITY ANALYSIS

Slope stability analyses were performed using the PCSTABL5 computer program, which was developed by Purdue University in conjunction with the Indiana State Highway Commission. PCSTABL5 utilizes a two-dimensional limiting equilibrium method to calculate the factor of safety. For this analysis, The Simplified Janbu Method of Slices was used in analysis of block failure surfaces. A search routine was used to identify the critical potential failure surface in each case analyzed.

Computer-generated output files for each case analyzed are included in this appendix section. Typically, slope cross sections selected for stability analyses represent the "worst case" conditions anticipated across the subject site. Strength parameters assumed in the analyses are indicated in the output files, and are summarized below. Selection of strength parameters was based on laboratory testing, and previous experience with similar soil and formational materials. The shear strength parameters assumed are considered to be conservative representations of the actual strength of materials on site.

APPENDIX C (continued)

SLOPE STABILITY ANALYSIS

Soil Type or Condition	Total Unit Weight (pcf)	Cohesion Intercept (psf)	Friction Angle (degrees)
Sweetwater Sandstone and Conglomerate (Tsw)	130	700	28
Sweetwater Claystone (Tsw)			
Along Bedding:	130	50	10
Across Bedding:	130	200	15
Compacted Fill	130	200	28

The strength parameters selected to represent compacted fill are based on an average of direct shear tests conducted by Geocon Incorporated, on samples remolded to approximately 90 percent of maximum dry density.

CROSS SECTION A-A'

The proposed 48-foot high cut slope of cross section A-A', Figure 2, was analyzed for deep-seated potential failure surfaces along weak claystone beds of the Sweetwater Formation. Block failure along the base of the lower claystone bed, beneath the toe of the proposed slope, was determined to be the most critical mode of failure from analysis of several potential failure modes. Given the assumed field conditions, a buttress fill with a 55-foot wide key and a drained, 1:1 (horizontal:vertical) backcut slope will be required to stabilize the proposed cut slope. Due to the anticipated thickness and distribution of claystone beds beneath the toe of the slope, a minimum keyway depth of 15 feet will be

APPENDIX C (continued)

SLOPE STABILITY ANALYSIS

necessary. Minimum calculated factor-of-safety for the slope, with the recommended buttress fill is greater than 1.5, as shown on Figure C-1.

Stability of the backcut slope during construction was also examined with consideration given to the anticipated phreatic condition exposed during excavation of the keyway. In the analysis it was assumed that existing undocumented fill soils would be removed prior to keyway construction. Potential block failure along weak claystone beds exposed near the toe of the backcut slope was determined to be the most critical failure mode of the potential failure surfaces examined. For an undrained condition modeled behind the face of the backcut slope, stability of the recommended keyway excavation is marginal. The minimum calculated factor of safety for the backcut slope for an undrained condition is 1.15, as shown on Figure C-2.

Lowering of the existing phreatic surface or providing a cut-off drain system behind the excavated backcut slope of the recommended buttress keyway has the effect of increasing the calculated factor of safety considerably for the case analyzed. The minimum calculated factor of safety for a completely drained condition behind the backcut slope is greater than 1.5, as shown in Figure C-3.

APPENDIX C (continued)

SLOPE STABILITY ANALYSIS

Cross Section E-E'

The proposed 30-foot high cut slope of Cross Section E-E', Figure 3, was analyzed for deep-seated potential failure along weak claystone beds of the Sweetwater Formation. Block failure along the base of claystone beds beneath the toe of the proposed cut slope was determined to be the most critical failure mode from analysis of several potential failure surfaces. Given the assumed conditions the construction of a buttress fill with a 20-foot wide keyway and a drained, 1:1 backcut slope will be required to stabilize the proposed cut slope. Due to the anticipated thickness and distribution of claystone beds beneath the toe of the proposed slope, a keyway depth of 15 feet will be necessary. Limitations to construction of the recommended buttress fill have been imposed due to the location of an existing roadway (Sweet Springs Boulevard) adjacent to the top of the proposed cut slope. It is understood that this roadway is to remain open during construction. It is anticipated that the recommended buttress fill may need to be overbuilt and trimmed back to the final design grade in order to accommodate a minimum equipment width of 15 to 20 feet at the top of the constructed buttress. The minimum calculated factor of safety for the recommended buttress fill is greater than 1.5, as shown in Figure C-4.

Stability of the backcut for the recommended keyway excavation during construction was examined as well with consideration given to the phreatic conditions anticipated in the exposed backcut slope. Potential block failure along weak claystone beds exposed near the toe of the backcut slope was determined to be the most critical failure mode of the potential

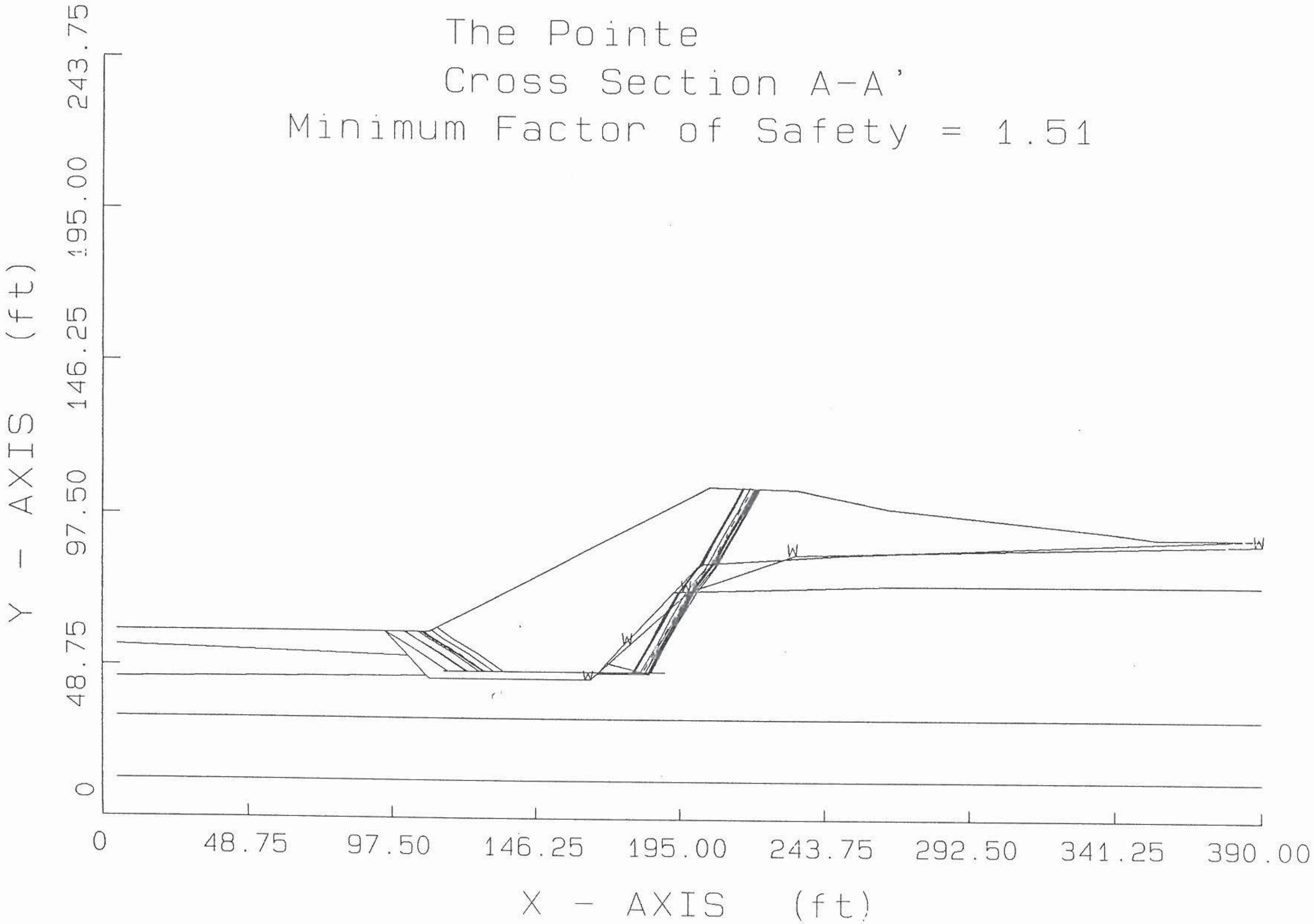
APPENDIX C (continued)

SLOPE STABILITY ANALYSIS

failure surfaces examined. For an undrained condition modeled behind the face of the backcut slope, the minimum calculated factor of safety was well below unity. The stability analysis results, as shown in Figure C-5, imply that failure of the backcut slope is highly probable given the assumed conditions.

Lowering of the phreatic surface or providing a cut-off drain system behind the backcut slope has the effect of increasing the calculated factor of safety considerably for the case analyzed. The stability of the backcut slope under fully drained conditions; however, is marginal for the assumed conditions, as shown in Figure C-6.

File No. 01687-03-07



The Pointe
Cross Section A-A'
Minimum Factor of Safety = 1.51

Figure C-1

```
                    ** PCSTABL5 **

                          by
                   Purdue University


                --Slope Stability Analysis--
            Simplified Janbu, Simplified Bishop
               or Spencer's Method of Slices

  Run Date:                   6-27-90
  Time of Run:                10:15
  Run By:                     ebr
  Input Data Filename:        A:POINTE7.DAT
  Output Filename:            A:POINTE7.OUT
  Plotted Output Filename:    POINTE7.PLT



  PROBLEM DESCRIPTION         The Pointe
                              Cross Section A-A'
                              Buttress Fill
                              Keyway 15' Deep by 55' Wide
                              Phreatic Surface Present
                              Block Failure Through Lower Claystone Bed
                              Figure C-1 (continued)



  BOUNDARY COORDINATES

     8 Top   Boundaries
    26 Total Boundaries

  Boundary    X-Left     Y-Left     X-Right    Y-Right    Soil Type
     No.       (ft)       (ft)       (ft)       (ft)      Below Bnd

      1         5.00      60.00      95.00      60.00         1
      2        95.00      60.00     110.00      60.00         3
      3       110.00      60.00     205.00     107.00         3
      4       205.00     107.00     235.00     106.00         3
      5       235.00     106.00     265.00     100.00         3
      6       265.00     100.00     340.00      92.00         3
      7       340.00      92.00     355.00      90.00         3
      8       355.00      90.00     390.00      90.00         3
      9       202.00      82.00     250.00      85.00         2
     10       250.00      85.00     390.00      90.00         2
     11       193.00      73.00     202.00      82.00         2
     12       193.00      73.00     265.00      75.00         1
```

```
     13          265.00       75.00       390.00       75.00          1
     14          170.00       50.00       193.00       73.00          1
     15          170.00       50.00       185.00       47.00          2
     16          167.00       47.00       170.00       50.00          2
     17          167.00       47.00       185.00       47.00          1
     18          165.00       45.00       167.00       47.00          1
     19           95.00       60.00       103.00       52.00          1
     20            5.00       55.00       103.00       52.00          2
     21          103.00       52.00       109.00       46.00          2
     22            5.00       45.00       109.00       46.00          1
     23          109.00       46.00       110.00       45.00          1
     24          110.00       45.00       165.00       45.00          1
     25            5.00       32.00       390.00       32.00          2
     26            5.00       12.00       390.00       12.00          1


   ISOTROPIC SOIL PARAMETERS


     3 Type(s) of Soil


    Soil   Total   Saturated  Cohesion Friction   Pore    Pressure   Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
     No.   (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)    No.

      1    130.0    130.0     700.0     28.0     .00        .0      1
      2    130.0    130.0      50.0     10.0     .00        .0      1
      3    130.0    130.0     200.0     29.0     .00        .0      1


   ANISOTROPIC STRENGTH PARAMETERS
        1 soil type(s)


    Soil Type  2 Is Anisotropic

    Number Of Direction Ranges Specified =  3


    Direction     Counterclockwise     Cohesion     Friction
      Range       Direction Limit     Intercept       Angle
       No.             (deg)            (psf)         (deg)

        1              -10.0            200.0          15.0
        2               10.0             50.0          10.0
        3               90.0            200.0          15.0
```

```
 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


 Unit Weight of Water =  62.40


 Piezometric Surface No.  1 Specified by  5 Coordinate Points

   Point      X-Water      Y-Water
    No.         (ft)         (ft)

     1        165.00        45.00
     2        178.00        56.00
     3        198.00        73.00
     4        234.00        85.00
     5        390.00        88.00


 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.


 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.


 100 Trial Surfaces Have Been Generated.


 2 Boxes Specified For Generation Of Central Block Base


 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  10.0


 Box          X-Left      Y-Left     X-Right     Y-Right        Height
 No.           (ft)        (ft)        (ft)        (ft)           (ft)

  1          115.00       47.50      157.00       47.50            .00
  2          160.00       47.50      190.00       47.50            .00


 Following Are Displayed The Ten Most Critical Of The Trial
 Failure Surfaces Examined.  They Are Ordered - Most Critical
 First.
```

```
* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 13 Coordinate Points


  Point        X-Surf        Y-Surf
   No.          (ft)          (ft)

    1          108.10         60.00
    2          112.09         57.65
    3          120.71         52.58
    4          129.32         47.50
    5          182.52         47.50
    6          187.67         56.07
    7          192.82         64.64
    8          197.92         73.14
    9          204.35         80.80
   10          205.55         82.22
   11          210.62         90.84
   12          215.70         99.45
   13          219.85        106.50

       ***      1.505    ***
```

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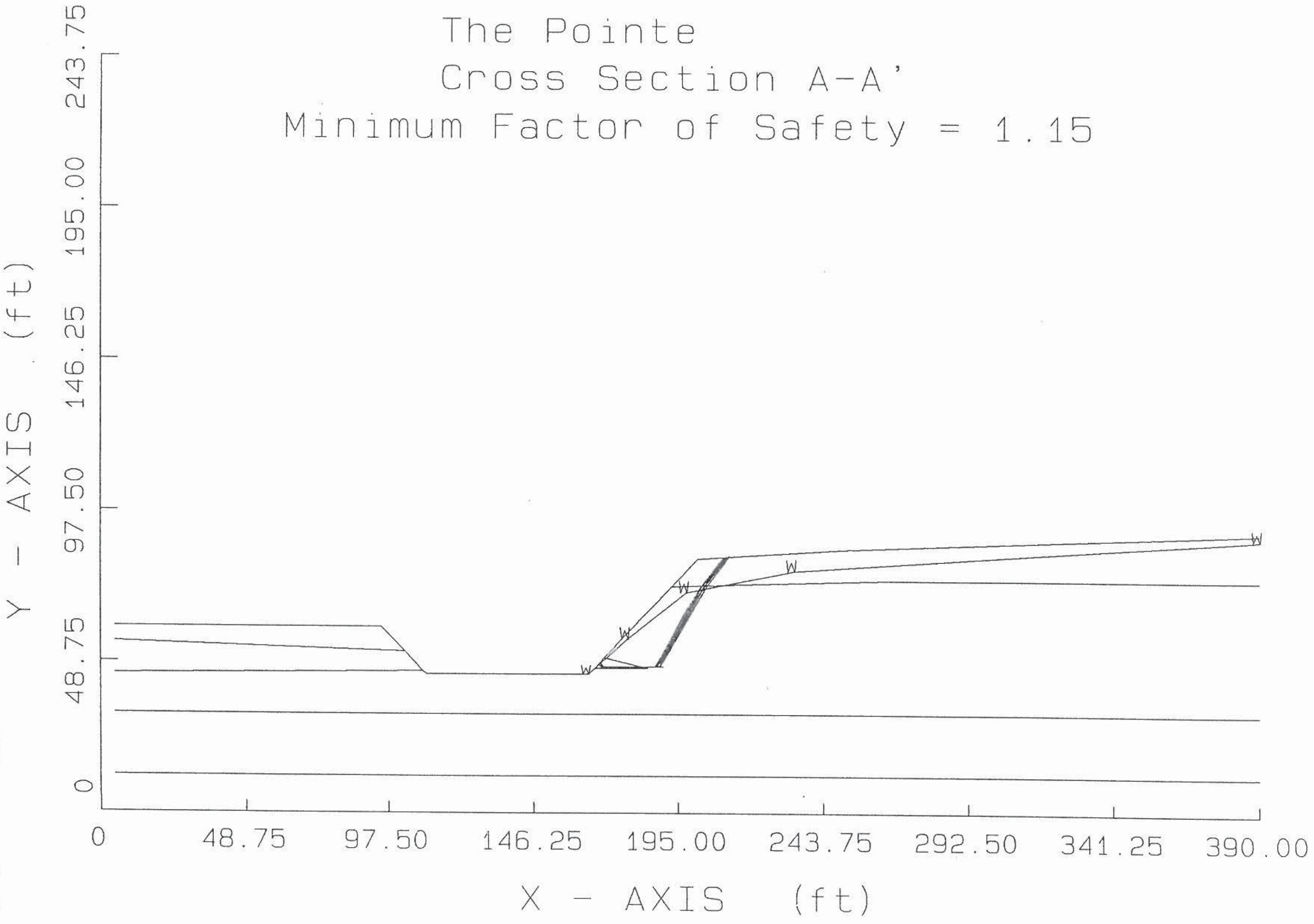

The Pointe
Cross Section A-A'
Minimum Factor of Safety = 1.15

Figure C-2

```
                    ** PCSTABL5 **

                          by
                   Purdue University


             --Slope Stability Analysis--
          Simplified Janbu, Simplified Bishop
            or Spencer's Method of Slices


Run Date:                  6-27-90
Time of Run:               10:15
Run By:                    EBR
Input Data Filename:       A:POINTE7B.DAT
Output Filename:           A:POINTE7B.OUT
Plotted Output Filename:   POINTE7B.PLT



PROBLEM DESCRIPTION         The Pointe
                            Cross Section A-A'
                            Excavated Keyway for Buttress Fill Construction
                            Keyway 15' Deep by 55' Wide
                            Backcut Inclination 1:1 (hor.:vert.)
                            Block Failure Through Lower Claystone Bed
                            Phreatic Surface Present
                            Figure C-2 (continued)



BOUNDARY COORDINATES

   11 Top   Boundaries
   19 Total Boundaries


Boundary     X-Left      Y-Left      X-Right     Y-Right     Soil Type
  No.         (ft)        (ft)        (ft)        (ft)       Below Bnd

   1          5.00       60.00       95.00       60.00          1
   2         95.00       60.00      103.00       52.00          1
   3        103.00       52.00      109.00       46.00          2
   4        109.00       46.00      110.00       45.00          1
   5        110.00       45.00      165.00       45.00          1
   6        165.00       45.00      167.00       47.00          1
   7        167.00       47.00      170.00       50.00          2
   8        170.00       50.00      193.00       73.00          1
   9        193.00       73.00      202.00       82.00          2
  10        202.00       82.00      250.00       85.00          2
  11        250.00       85.00      390.00       90.00          2
  12        193.00       73.00      265.00       75.00          1
```

```
     12          193.00       73.00      265.00       75.00        1
     13          265.00       75.00      390.00       75.00        1
     14          170.00       50.00      185.00       47.00        2
     15          167.00       47.00      185.00       47.00        1
     16            5.00       55.00      103.00       52.00        2
     17            5.00       45.00      109.00       46.00        1
     18            5.00       32.00      390.00       32.00        2
     19            5.00       12.00      390.00       12.00        1


 ISOTROPIC SOIL PARAMETERS


   3 Type(s) of Soil


  Soil  Total   Saturated  Cohesion Friction   Pore    Pressure   Piez.
  Type Unit Wt. Unit Wt. Intercept   Angle   Pressure Constant Surface
   No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.

    1   130.0    130.0     700.0     28.0      .00        .0       1
    2   120.0    120.0      50.0     10.0      .00        .0       1
    3   130.0    130.0     200.0     29.0      .00        .0       1


 ANISOTROPIC STRENGTH PARAMETERS
      1 soil type(s)


  Soil Type  2 Is Anisotropic

  Number Of Direction Ranges Specified =  3


  Direction    Counterclockwise    Cohesion     Friction
    Range      Direction Limit    Intercept      Angle
     No.           (deg)            (psf)        (deg)

      1            -10.0            200.0         15.0
      2             10.0             50.0         10.0
      3             90.0            200.0         15.0
```

```
1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


Unit Weight of Water =  62.40


Piezometric Surface No.  1 Specified by  5 Coordinate Points


  Point       X-Water      Y-Water
   No.          (ft)         (ft)

    1         165.00        45.00
    2         178.00        56.00
    3         198.00        71.00
    4         234.00        78.00
    5         390.00        88.00


A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  10.0


Box          X-Left      Y-Left     X-Right     Y-Right        Height
No.           (ft)        (ft)        (ft)        (ft)           (ft)

 1          169.00       47.50      173.00       47.50            .00
 2          175.00       47.50      190.00       47.50            .00
```

```
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined.  They Are Ordered - Most Critical
First.


* * Safety Factors Are Calculated By The Modified Janbu Method * *


Failure Surface Specified By  9 Coordinate Points


  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)

    1        168.24       48.24
    2        169.11       47.50
    3        189.07       47.50
    4        194.22       56.07
    5        199.37       64.64
    6        204.52       73.22
    7        204.59       73.32
    8        211.02       80.98
    9        212.42       82.65

       ***      1.154    ***
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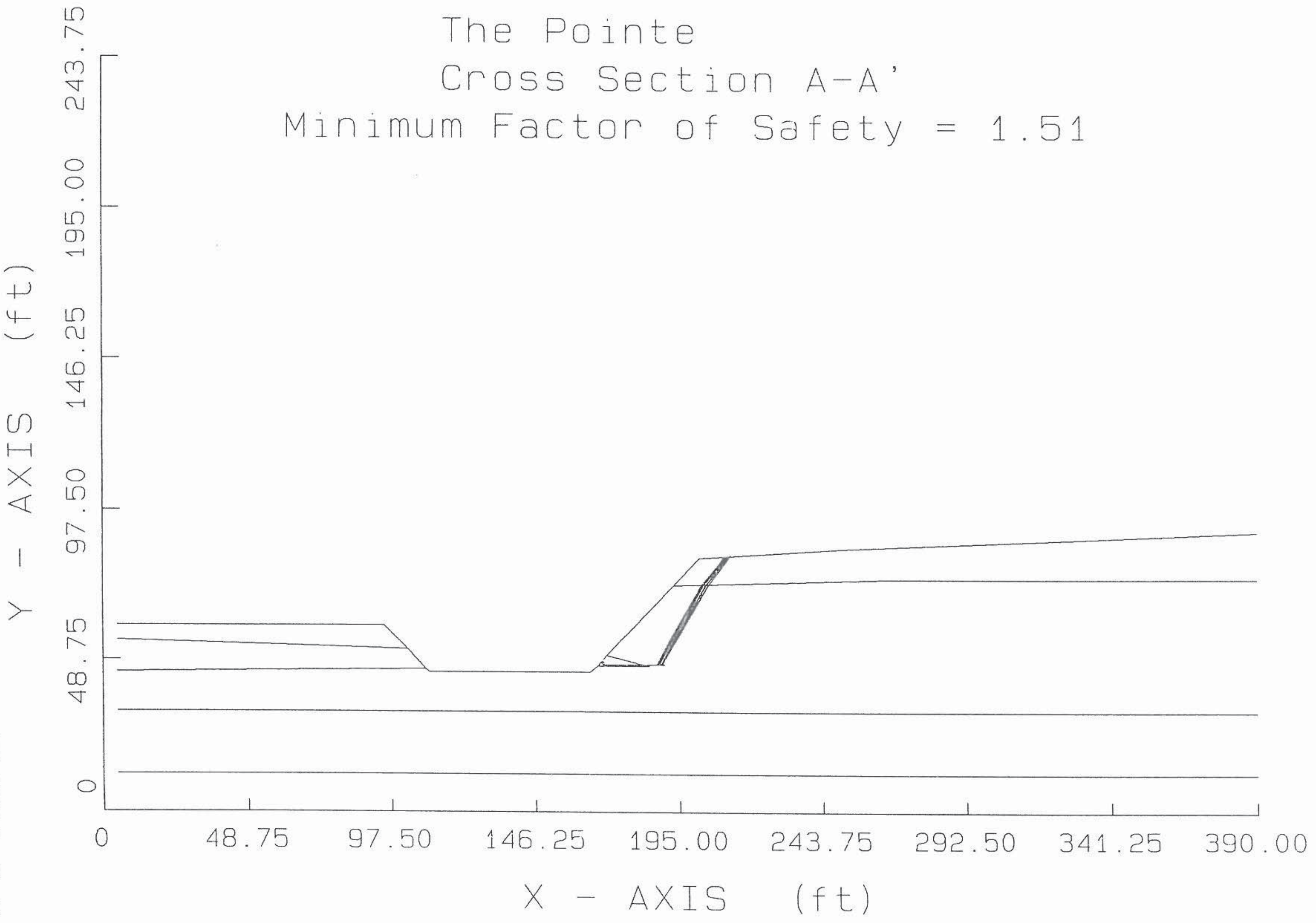

The Pointe
Cross Section A-A'
Minimum Factor of Safety = 1.51

Figure C-3

```
                    ** PCSTABL5 **

                          by
                   Purdue University


              --Slope Stability Analysis--
           Simplified Janbu, Simplified Bishop
             or Spencer's Method of Slices


Run Date:                  7-10-90
Time of Run:               9:00AM
Run By:                    EBR
Input Data Filename:       A:POINTE7C.DAT
Output Filename:           A:POINTE7C.OUT
Plotted Output Filename:   POINTE7C.PLT



PROBLEM DESCRIPTION        The Pointe
                           Cross Section A-A'
                           Excavated Keyway for Buttress Fill Construction
                           Keyway 15' Deep by 55' Wide
                           Backcut Inclination 1:1 (hor.:vert.)
                           Block Failure Through Lower Claystone Bed
                           Drained Condition
                           Figure C-3 (continued)



BOUNDARY COORDINATES

   11 Top   Boundaries
   19 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)       (ft)        (ft)        (ft)      Below Bnd

    1          5.00      60.00       95.00       60.00          1
    2         95.00      60.00      103.00       52.00          1
    3        103.00      52.00      109.00       46.00          2
    4        109.00      46.00      110.00       45.00          1
    5        110.00      45.00      165.00       45.00          1
    6        165.00      45.00      167.00       47.00          1
    7        167.00      47.00      170.00       50.00          2
    8        170.00      50.00      193.00       73.00          1
    9        193.00      73.00      202.00       82.00          2
   10        202.00      82.00      250.00       85.00          2
   11        250.00      85.00      390.00       90.00          2
```

```
     12        193.00       73.00      265.00       75.00       1
     13        265.00       75.00      390.00       75.00       1
     14        170.00       50.00      185.00       47.00       2
     15        167.00       47.00      185.00       47.00       1
     16          5.00       55.00      103.00       52.00       2
     17          5.00       45.00      109.00       46.00       1
     18          5.00       32.00      390.00       32.00       2
     19          5.00       12.00      390.00       12.00       1


 ISOTROPIC SOIL PARAMETERS


   3 Type(s) of Soil


  Soil   Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
  Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
   No.   (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)     No.

    1   130.0    130.0     700.0     28.0     .00        .0      1
    2   120.0    120.0      50.0     10.0     .00        .0      1
    3   130.0    130.0     200.0     29.0     .00        .0      1


 ANISOTROPIC STRENGTH PARAMETERS
       1 soil type(s)


  Soil Type  2 Is Anisotropic

  Number Of Direction Ranges Specified =  3


  Direction    Counterclockwise     Cohesion      Friction
    Range       Direction Limit     Intercept       Angle
     No.            (deg)             (psf)         (deg)

      1             -10.0             200.0          15.0
      2              10.0              50.0          10.0
      3              90.0             200.0          15.0


  A Critical Failure Surface Searching Method, Using A Random
  Technique For Generating Sliding Block Surfaces, Has Been
  Specified.


  The Active And Passive Portions Of The Sliding Surfaces
  Are Generated According To The Rankine Theory.
```

```
100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  10.0


Box          X-Left      Y-Left     X-Right     Y-Right       Height
No.           (ft)        (ft)        (ft)        (ft)          (ft)

 1          169.00       47.50      173.00       47.50           .00
 2          175.00       47.50      190.00       47.50           .00


Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined.  They Are Ordered - Most Critical
First.


* * Safety Factors Are Calculated By The Modified Janbu Method * *


Failure Surface Specified By  9 Coordinate Points


  Point        X-Surf       Y-Surf
   No.          (ft)         (ft)

    1          168.20        48.20
    2          169.03        47.50
    3          188.65        47.50
    4          193.80        56.07
    5          198.95        64.64
    6          204.10        73.22
    7          204.16        73.31
    8          210.58        80.97
    9          211.97        82.62


      ***      1.512    ***
```

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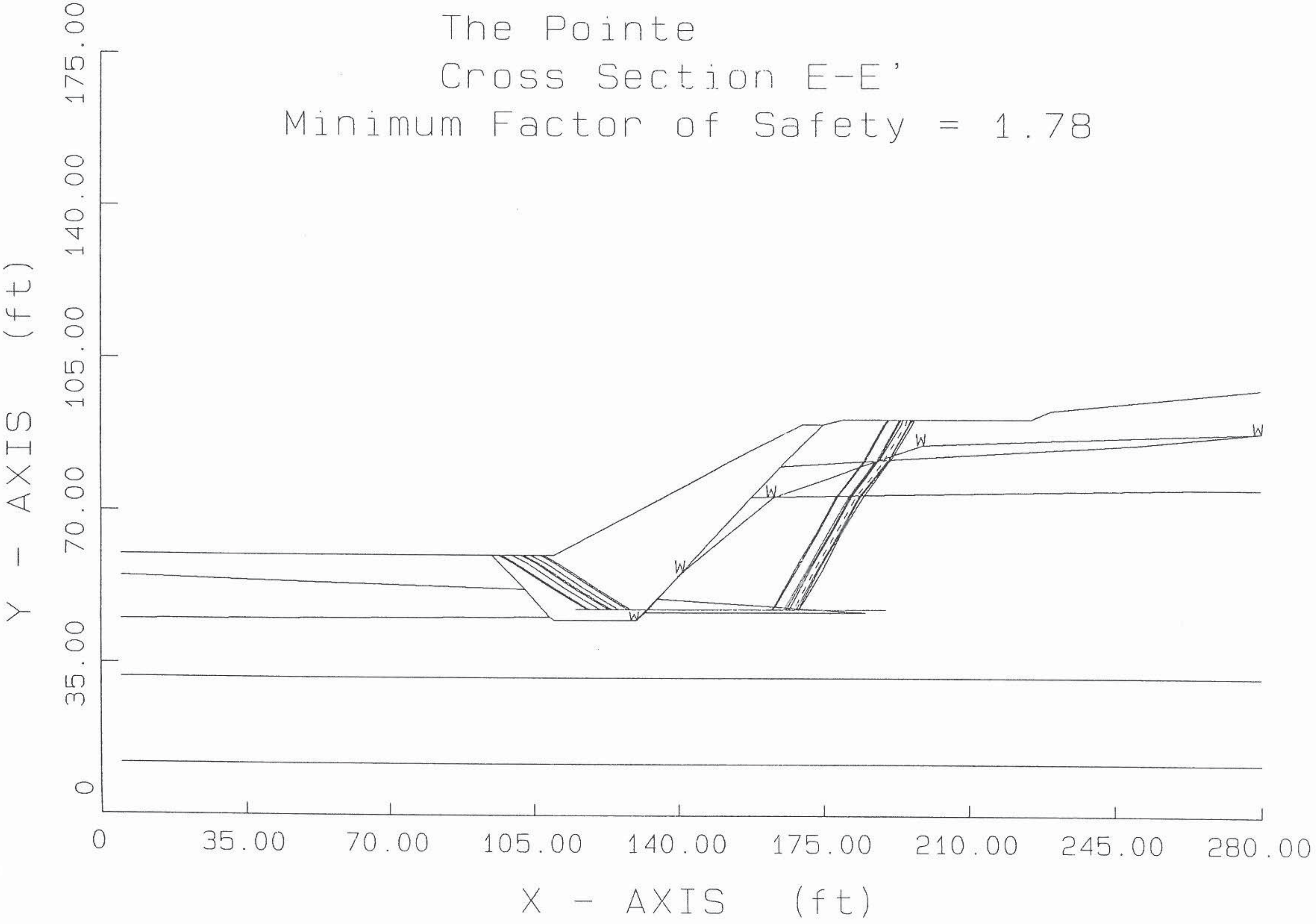

The Pointe
Cross Section E-E'
Minimum Factor of Safety = 1.78

Figure C-4

```
                   ** PCSTABL5 **

                         by
                   Purdue University


              --Slope Stability Analysis--
           Simplified Janbu, Simplified Bishop
              or Spencer's Method of Slices


Run Date:                    6-27-90
Time of Run:                 5:00
Run By:                      EBR
Input Data Filename:         A:POINTE8.DAT
Output Filename:             A:POINTE8.OUT
Plotted Output Filename:     POINTE8.PLT



PROBLEM DESCRIPTION          The Pointe
                             Cross Section E-E'
                             Buttress Fill
                             Keyway 15' Deep by 20' Wide
                             Block Failure Through Lower Claystone Bed
                             Phreatic Surface Present
                             Figure C-4 (continued)



BOUNDARY COORDINATES

    8 Top   Boundaries
   27 Total Boundaries


Boundary      X-Left      Y-Left     X-Right      Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)         (ft)      Below Bnd

    1           5.00       60.00       95.00       60.00          1
    2          95.00       60.00      110.00       60.00          3
    3         110.00       60.00      170.00       90.00          3
    4         170.00       90.00      175.00       90.00          3
    5         175.00       90.00      180.00       91.00          3
    6         180.00       91.00      225.00       91.00          3
    7         225.00       91.00      230.00       93.00          3
    8         230.00       93.00      280.00       98.00          3
    9         165.00       80.00      175.00       90.00          3
   10         165.00       80.00      250.00       85.00          2
   11         250.00       85.00      280.00       88.00          2
   12         158.00       73.00      165.00       80.00          2
```

```
       13         158.00       73.00       265.00       75.00          1
       14         265.00       75.00       280.00       75.00          1
       15         135.00       50.00       158.00       73.00          1
       16         135.00       50.00       185.00       47.00          2
       17         132.00       47.00       135.00       50.00          2
       18         132.00       47.00       185.00       47.00          1
       19         130.00       45.00       132.00       47.00          1
       20          95.00       60.00       103.00       52.00          1
       21           5.00       55.00       103.00       52.00          2
       22         103.00       52.00       109.00       46.00          2
       23           5.00       45.00       109.00       46.00          1
       24         109.00       46.00       110.00       45.00          1
       25         110.00       45.00       130.00       45.00          1
       26           5.00       32.00       280.00       32.00          2
       27           5.00       12.00       280.00       12.00          1


 ISOTROPIC SOIL PARAMETERS


   3 Type(s) of Soil


  Soil  Total  Saturated  Cohesion Friction   Pore   Pressure  Piez.
  Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
  No.   (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)    No.

   1   130.0    130.0     700.0     28.0     .00        .0      1
   2   130.0    130.0      50.0     10.0     .00        .0      1
   3   130.0    130.0     200.0     29.0     .00        .0      1


 ANISOTROPIC STRENGTH PARAMETERS
      1 soil type(s)


  Soil Type  2 Is Anisotropic

  Number Of Direction Ranges Specified =  3


  Direction    Counterclockwise     Cohesion     Friction
    Range       Direction Limit     Intercept      Angle
     No.            (deg)             (psf)        (deg)

      1             -10.0             200.0         15.0
      2              10.0              50.0         10.0
      3              90.0             200.0         15.0
```

```
 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED


 Unit Weight of Water =  62.40


 Piezometric Surface No.  1 Specified by  5 Coordinate Points

   Point       X-Water      Y-Water
    No.          (ft)         (ft)

     1         130.00        45.00
     2         141.00        56.00
     3         163.00        73.00
     4         199.00        85.00
     5         280.00        88.00


 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.


 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.


 100 Trial Surfaces Have Been Generated.


 2 Boxes Specified For Generation Of Central Block Base


 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  10.0


 Box          X-Left      Y-Left     X-Right     Y-Right        Height
 No.           (ft)        (ft)        (ft)        (ft)           (ft)

  1          115.00       47.50      132.00       47.50           .00
  2          160.00       47.50      190.00       47.50           .00
```

```
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined.  They Are Ordered - Most Critical
First.


* * Safety Factors Are Calculated By The Modified Janbu Method * *


Failure Surface Specified By 13 Coordinate Points


  Point        X-Surf       Y-Surf
   No.          (ft)         (ft)

    1          102.17        60.00
    2          106.15        57.65
    3          114.77        52.58
    4          123.39        47.50
    5          167.40        47.50
    6          167.85        48.03
    7          173.00        56.60
    8          178.15        65.17
    9          183.13        73.47
   10          189.56        81.13
   11          189.84        81.46
   12          194.91        90.08
   13          195.46        91.00

        ***      1.777   ***
```

```
                    ** PCSTABL5 **

                          by
                   Purdue University


               --Slope Stability Analysis--
            Simplified Janbu, Simplified Bishop
               or Spencer's Method of Slices


 Run Date:                   6-27-90
 Time of Run:                5:30
 Run By:                     EBR
 Input Data Filename:        A:POINTE8B.DAT
 Output Filename:            A:POINTE8B.OUT
 Plotted Output Filename:    POINTE8B.PLT



 PROBLEM DESCRIPTION         The Pointe
                             Cross Section E-E'
                             Excavated Keyway for Buttress Fill Construction
                             Keyway 15' Deep by 20' Wide
                             Backcut Inclination 1:1 (hor.:vert.)
                             Block Failure Through Lower Claystone Bed
                             Phreatic Surface Present
                             Figure C-5 (continued)



 BOUNDARY COORDINATES

   14 Top   Boundaries
   24 Total Boundaries


 Boundary    X-Left     Y-Left     X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)        (ft)       (ft)     Below Bnd

    1          5.00      60.00       95.00      60.00        1
    2         95.00      60.00      103.00      52.00        1
    3        103.00      52.00      109.00      46.00        2
    4        109.00      46.00      110.00      45.00        1
    5        110.00      45.00      130.00      45.00        1
    6        130.00      45.00      132.00      47.00        1
    7        132.00      47.00      135.00      50.00        2
    8        135.00      50.00      158.00      73.00        1
    9        158.00      73.00      165.00      80.00        2
```

```
    10         165.00       80.00      175.00        90.00          3
    11         175.00       90.00      180.00        91.00          3
    12         180.00       91.00      225.00        91.00          3
    13         225.00       91.00      230.00        93.00          3
    14         230.00       93.00      280.00        98.00          3
    15         165.00       80.00      250.00        85.00          2
    16         250.00       85.00      280.00        88.00          2
    17         158.00       73.00      265.00        75.00          1
    18         265.00       75.00      280.00        75.00          1
    19         135.00       50.00      185.00        47.00          2
    20         132.00       47.00      185.00        47.00          1
    21           5.00       55.00      103.00        52.00          2
    22           5.00       45.00      109.00        46.00          1
    23           5.00       32.00      280.00        32.00          2
    24           5.00       12.00      280.00        12.00          1


 ISOTROPIC SOIL PARAMETERS


   3 Type(s) of Soil


  Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
  Type Unit Wt. Unit Wt. Intercept  Angle  Pressure Constant Surface
   No.  (pcf)    (pcf)     (psf)    (deg)   Param.    (psf)    No.

    1   130.0    130.0     700.0    28.0     .00        .0      1
    2   130.0    130.0      50.0    10.0     .00        .0      1
    3   130.0    130.0     200.0    29.0     .00        .0      1


 ANISOTROPIC STRENGTH PARAMETERS
      1 soil type(s)


  Soil Type  2 Is Anisotropic

  Number Of Direction Ranges Specified =  3


  Direction    Counterclockwise     Cohesion     Friction
    Range       Direction Limit    Intercept      Angle
     No.            (deg)            (psf)        (deg)

      1             -10.0            200.0         15.0
      2              10.0             50.0         10.0
      3              90.0            200.0         15.0
```

```
 1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

 Unit Weight of Water =  62.40

 Piezometric Surface No.  1 Specified by  5 Coordinate Points

   Point      X-Water     Y-Water
    No.        (ft)        (ft)

     1        130.00       45.00
     2        141.00       56.00
     3        163.00       73.00
     4        199.00       85.00
     5        280.00       88.00


 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.

 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.

 100 Trial Surfaces Have Been Generated.

 2 Boxes Specified For Generation Of Central Block Base

 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  10.0

 Box        X-Left     Y-Left    X-Right    Y-Right      Height
 No.         (ft)       (ft)       (ft)       (ft)        (ft)

  1         134.00     47.50     140.00      47.50         .00
  2         160.00     47.50     190.00      47.50         .00
```

```
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined.  They Are Ordered - Most Critical
First.


* * Safety Factors Are Calculated By The Modified Janbu Method * *


Failure Surface Specified By 11 Coordinate Points


  Point        X-Surf       Y-Surf
   No.          (ft)         (ft)

    1          133.35        48.35
    2          134.37        47.50
    3          165.23        47.50
    4          165.78        48.15
    5          170.93        56.72
    6          176.08        65.30
    7          180.97        73.43
    8          187.40        81.09
    9          187.60        81.33
   10          192.67        89.95
   11          193.30        91.00

        ***       .637   ***
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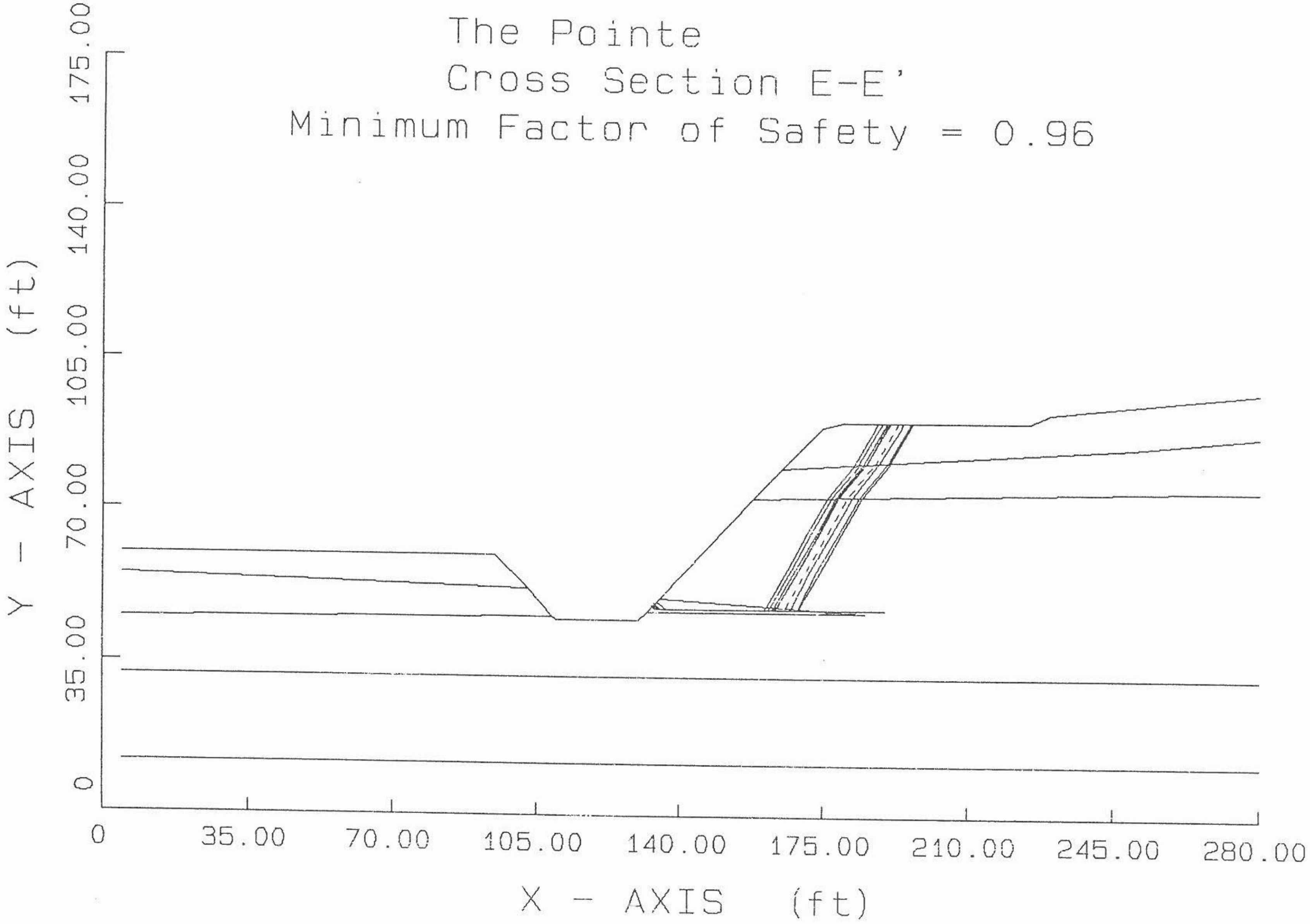
File No. 01687-03-07



The Pointe
Cross Section E-E'
Minimum Factor of Safety = 0.96

Figure C-6

```
                    ** PCSTABL5 **

                          by
                   Purdue University


             --Slope Stability Analysis--
         Simplified Janbu, Simplified Bishop
            or Spencer's Method of Slices


Run Date:                  6-28-90
Time of Run:               1215
Run By:                    ebr
Input Data Filename:       a:pointe8c.dat
Output Filename:           a:pointe8c.out
Plotted Output Filename:   pointe8c.plt



PROBLEM DESCRIPTION         The Pointe
                            Cross Section E-E'
                            Excavated Keyway for Buttress Fill Construction
                            Keyway 15' Deep by 20' Wide
                            Backcut Inclination 1:1 (hor.:vert.)
                            Block Failure Through Lower Claystone Bed
                            Drained Condition
                            Figure C-6 (continued)



BOUNDARY COORDINATES

   14 Top   Boundaries
   24 Total Boundaries


Boundary     X-Left     Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)       (ft)        (ft)        (ft)      Below Bnd

    1          5.00      60.00       95.00       60.00         1
    2         95.00      60.00      103.00       52.00         1
    3        103.00      52.00      109.00       46.00         2
    4        109.00      46.00      110.00       45.00         1
    5        110.00      45.00      130.00       45.00         1
    6        130.00      45.00      132.00       47.00         1
    7        132.00      47.00      135.00       50.00         2
    8        135.00      50.00      158.00       73.00         1
    9        158.00      73.00      165.00       80.00         2
   10        165.00      80.00      175.00       90.00         3
   11        175.00      90.00      180.00       91.00         3
```

```
   12        180.00       91.00      225.00       91.00          3
   13        225.00       91.00      230.00       93.00          3
   14        230.00       93.00      280.00       98.00          3
   15        165.00       80.00      250.00       85.00          2
   16        250.00       85.00      280.00       88.00          2
   17        158.00       73.00      265.00       75.00          1
   18        265.00       75.00      280.00       75.00          1
   19        135.00       50.00      185.00       47.00          2
   20        132.00       47.00      185.00       47.00          1
   21          5.00       55.00      103.00       52.00          2
   22          5.00       45.00      109.00       46.00          1
   23          5.00       32.00      280.00       32.00          2
   24          5.00       12.00      280.00       12.00          1


ISOTROPIC SOIL PARAMETERS


  3 Type(s) of Soil


 Soil  Total  Saturated  Cohesion Friction   Pore    Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)     No.

   1   130.0    130.0     700.0     28.0     .00        .0      1
   2   130.0    130.0      50.0     10.0     .00        .0      1
   3   130.0    130.0     200.0     29.0     .00        .0      1


ANISOTROPIC STRENGTH PARAMETERS
    1 soil type(s)


 Soil Type  2 Is Anisotropic

 Number Of Direction Ranges Specified =  3


 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept      Angle
    No.            (deg)            (psf)        (deg)

     1             -10.0            200.0         15.0
     2              10.0             50.0         10.0
     3              90.0            200.0         15.0
```

```
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.


The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.


100 Trial Surfaces Have Been Generated.


2 Boxes Specified For Generation Of Central Block Base


Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  10.0


Box          X-Left      Y-Left     X-Right     Y-Right       Height
No.           (ft)        (ft)        (ft)        (ft)          (ft)

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    4          165.78        48.15
    5          170.93        56.72
    6          176.08        65.30
    7          180.97        73.43
    8          187.40        81.09
    9          187.60        81.33
   10          192.67        89.95
   11          193.30        91.00

     ***        .957    ***
```

APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

THE POINTE
UNIT I - RESORT AREA

SAN DIEGO COUNTY, CALIFORNIA

File No. 01687-03-07

RECOMMENDED GRADING SPECIFICATIONS

1 GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. It will be necessary that the Consultant provide adequate testing and observation services so that he may determine that, in his opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep him apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, and so forth, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that construction be stopped until the unacceptable conditions are corrected.

2 DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addendums) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3 MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than 3/4 inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of *soil* fill to allow for proper compaction of *soil* fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize** rock is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than 3/4 inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provided a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized, provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Representative samples of soil materials to be used for fill shall be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

4 CLEARING AND PREPARING AREAS TO BE FILLED

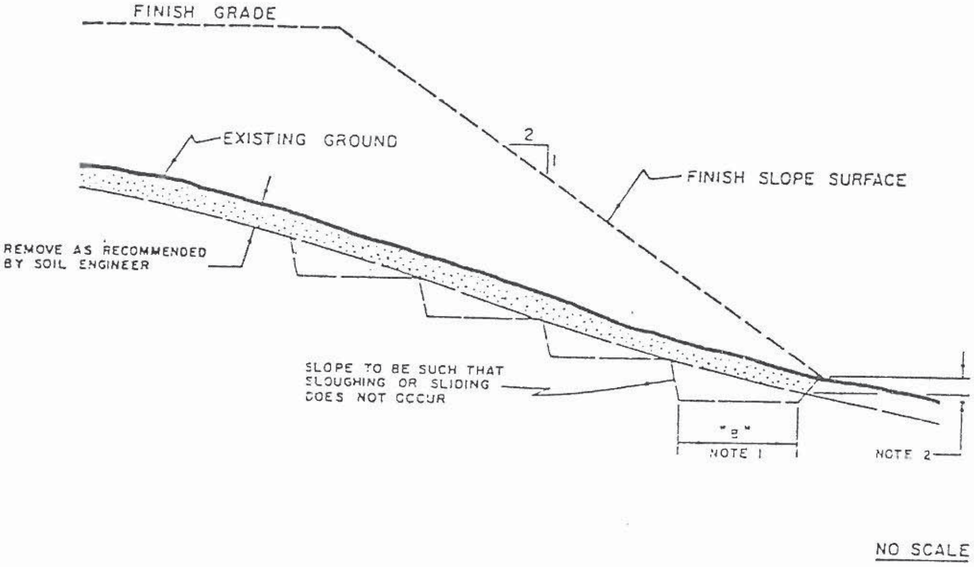
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1-1/2 inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments which are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter or other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction shall be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 6:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



NOTES:

(1) Key width "B" should be a minimum of 10 feet wide, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the bottom key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared, plowed or scarified, the surface should be disced or bladed by the Contractor until it is uniform and free from large clods. The area should then be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6.0 of these specifications.

5 COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6 PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D1557-78.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D1557-78. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum density has been achieved throughout the entire fill.

6.1.6 Soils having an Expansion Index of greater than 50 may be used in fills if placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading, as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 All rock placement, fill placement and flooding of approved granular soil in the windrows must be continuously observed by the Consultant or his representative.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent, maximum slope of 5 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made will be determined as described in Paragraph 6.3.3. Once a rock fill lift has been covered with soil fill, no additional rock fill lifts will be permitted over the soil fill.

6.3.3 Plate bearing tests, in accordance with ASTM D1196-64, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the number of passes of the compaction equipment to be performed. If performed, a minimum of three plate bearing tests shall be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted soil fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant shall be present during rock fill operations to verify that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading. In general, at least one test should be performed for each approximately 5,000 to 10,000 cubic yards of *rock* fill placed.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in his opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 All *rock* fill placement shall be continuously observed during placement by representatives of the Consultant.

7 OBSERVATION AND TESTING

7.1 The Consultant shall be the Owners representative to observe and perform tests during clearing, grubbing, filling and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill shall be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test shall be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2 The Consultant shall perform random field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion as to whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3 During placement of *rock* fill, the Consultant shall verify that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant shall request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. If performed, plate bearing tests will be performed randomly on the surface of the most-recently placed lift. Plate bearing tests will be performed to provide a basis for expressing an opinion as to whether the *rock* fill is adequately seated. The maximum deflection in the *rock* fill determined in Section 6.3.3 shall be less than the maximum deflection of the properly compacted *soil* fill. When any of the above criteria indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5 The Consultant shall observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6 Testing procedures shall conform to the following Standards as appropriate:

7.6.1 **Soil and Soil-Rock Fills:**

7.6.1.1 Field Density Test, ASTM D1556-82, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2 Field Density Test, Nuclear Method, ASTM D2922-81, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3 Laboratory Compaction Test, ASTM D1557-78, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

7.6.1.4 Expansion Index Test, Uniform Building Code Standard 29-2, *Expansion Index Test.*

7.6.2 **Rock Fills:**

7.6.2.1 Field Plate Bearing Test, ASTM D1196-64 (Reapproved 1977) *Standard Method for Nonrepresentative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8 PROTECTION OF WORK

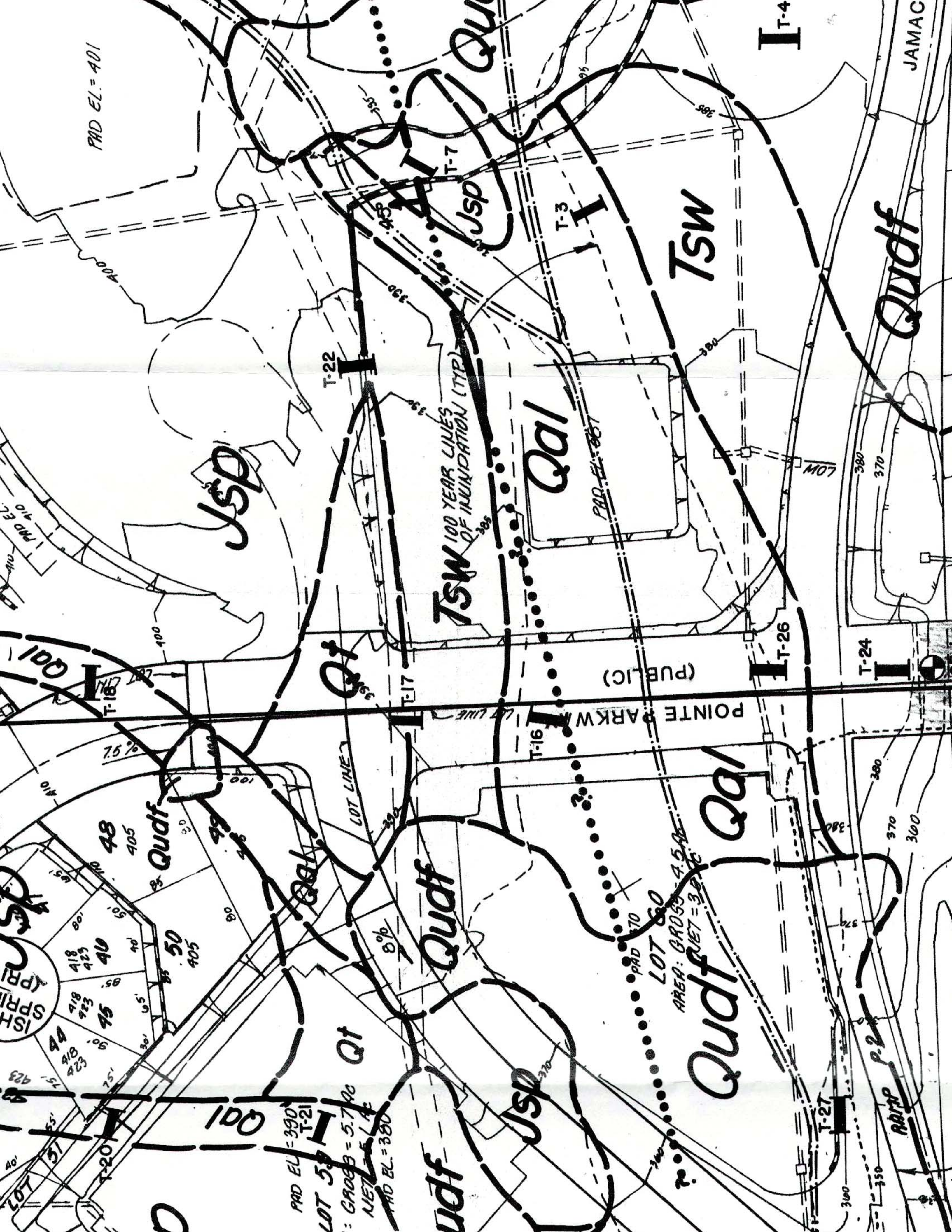
8.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9 CERTIFICATIONS AND FINAL REPORTS

9.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.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Tsw
Qal
Jsp
Qt
T-3
T-4
T-7
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T-18
T-20
T-21
T-22
T-24
T-26
T-27
POINTE PARKWAY
(PUBLIC)
LOT LINE
100 YEAR LINES OF INUNDATION (TYP)
PAD EL = 401
PAD EL 410
PAD EL 380
PAD 370
LOT 60
AREA: GROSS = 4.5 AC
NET = 3.2 AC
PAD EL = 390
LOT 59
GROSS = 5.7 AC
NET
PAD EL = 380
LOT 51
48
49
50
44
45
46
405
418
423
7.5%
8%
RAMP
P-2
JAMAC
ISH SPRI
(PRI
400
395
390
385
380
370
360
350