Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

Clairemont Village Apartment NDP

[Insert Permit Application Number]

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

REGISTERED PROFESSIONAL ENGINEER
MELLOR R. LANDY
No. 81085
Exp. 09-30-23
CIVIL
STATE OF CALIFORNIA

Mellor Landy RCE 81085
Provide Wet Signature and Stamp Above Line

Prepared For:

Clairemont Village Quad, LLC - KLEEGE ENTERPRISES
12625 High Bluff Dr. STE 310
San Diego
(858) 481-3081

Prepared By:

NOVA Engineering

Nova Engineering
4373 Viewridge Avenue, Suite A
San Diego, CA 92123
619-296-1010

Date:

04/25/22

Revised: 10/03/2022

Approved by: City of San Diego　　　　Date

The City of SAN DIEGO

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    - Maintenance Agreement (Form DS-3247) (when applicable)
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Acronyms

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

Certification Page

Project Name:
Permit Application

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and 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 the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. 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 source control and site design 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 the City Engineer 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

81085 | 09-30-23

PE# | Expiration Date

Mel Landy

Print Name

NOVA Engineering

Company

4/22/22

Date

Engineer's Stamp

Project Name: Clairemont Village Quad

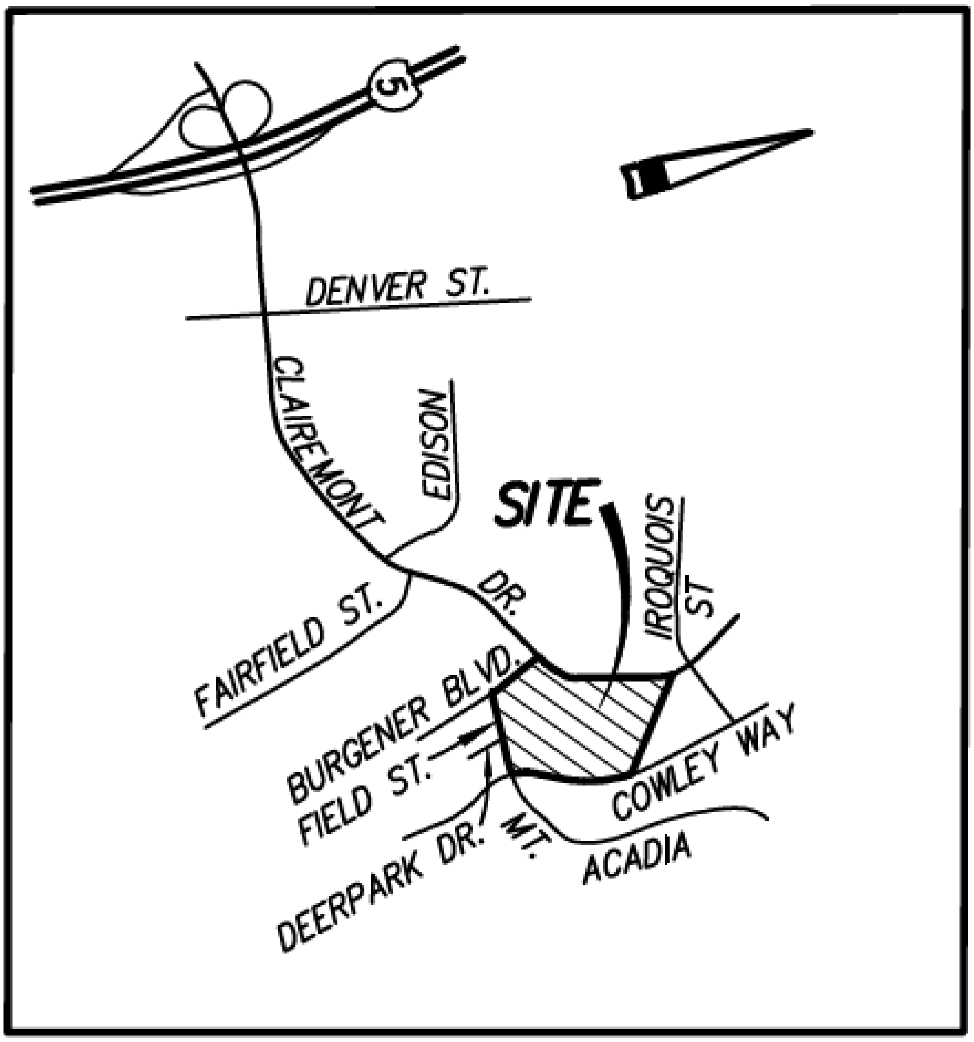
Submittal Record

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 last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	9/16/21	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal**
2	4/26/22	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Second Submittal
3	8/25/22	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Third Submittal
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Vicinity Map

Project Name: Clairemont Village Quad
Permit Application



VICINITY MAP
NO SCALE

City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

FORM
DS-560
September 2021

Stormwater Requirements Applicability Checklist

Project Address: 3001 & 3005 CLAIREMONT DRIVE **Project Number:** 697307

SECTION 1: Construction Stormwater Best Management Practices (BMP) Requirements

All construction sites are required to implement construction BMPs per the performance standards in the Stormwater Standards Manual. Some sites are also required to obtain coverage under the State Construction General Permit (CGP)[1], administered by the California State Water Resources Control Board.

For all projects, complete Part A - If the project is required to submit a Stormwater Pollution Prevention Plan (SWPPP) or Water Pollution Control Plan (WPCP), continue to Part B.

PART A – Determine Construction Phase Stormwater Requirements

1. Is the project subject to California's statewide General National Pollutant Discharge Elimination System (NPDES) permit for Stormwater Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ◉ Yes, SWPPP is required; skip questions 2-4. ○ No; proceed to the next question.

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and/or contact with stormwater?

   ○ Yes, WPCP is required; skip questions 3-4. ◉ No; proceed to the next question.

3. Does the project propose routine maintenance to maintain the original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

   ○ Yes, WPCP is required; skip question 4. ◉ No; proceed to the next question.

4. Does the project only include the following Permit types listed below?

   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, potholing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes, no document is required.

Check one of the boxes below and continue to Part B

◉ **If you checked "Yes" for question 1**, an SWPPP is REQUIRED – **continue to Part B**

○ **If you checked "No" for question 1 and checked "Yes" for question 2 or 3**, a WPCP is REQUIRED. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to Part B**

○ **If you check "No" for all questions 1-3 and checked "Yes" for question 4,** Part B does not apply, and no document is required. **Continue to Section 2.**

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at http://www.sandiego.gov/stormwater/regulations/index.shtml

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PART B – Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete Part B and continue to Section 2

☐ **1. ASBS**

A. Projects located in the ASBS watershed.

☑ **2. High Priority**

A. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and are not located in the ASBS watershed.
B. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and are not located in the ASBS watershed.

☐ **3. Medium Priority**

A. Projects that are not located in an ASBS watershed or designated as a High priority site.
B. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and are not located in an ASBS watershed.
C. WPCP projects (>5,000 square feet of ground disturbance) located within the Los Peñasquitos watershed management area.

☐ **4. Low Priority**

A. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

Section 2: Construction Stormwater BMP Requirements

Additional information for determining the requirements is found in the Stormwater Standards Manual.

PART C – Determine if Not Subject to Permanent Stormwater Requirements

Projects that are considered maintenance or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Stormwater Standards Manual are not subject to Permanent Stormwater BMPs.

- **If "yes" is checked for any number in Part C**: Proceed to Part F and check "Not Subject to Permanent Stormwater BMP Requirements."
- **If "no" is checked for all the numbers in Part C:** Continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact stormwater?

   ○ Yes ◉ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?

   ○ Yes ◉ No

3. Does the project fall under routine maintenance? Examples include but are not limited to roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay and pothole repair).

   ○ Yes ◉ No

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PART D – PDP Exempt Requirements

PDP Exempt projects are required to implement site design and source control BMPs.

- **If "yes" is checked for any questions in Part D**, continue to Part F and check the box labeled "PDP Exempt."
- **If "no" is checked for all questions in Part D**, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:
   - Are designed and constructed to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   - Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
   - Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Stormwater Standards manual?

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Stormwater Standards Manual?

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

PART E – Determine if Project is a Priority Development Project (PDP)

Projects that match one of the definitions below are subject to additional requirements, including preparation of a Stormwater Quality Management Plan (SWQMP).

- **If "yes" is checked for any number in Part E**, continue to Part F and check the box labeled "Priority Development Project."
- **If "no" is checked for every number in Part E**, continue to Part F and check the box labeled "Standard Development Project."

1. **New development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ○ Yes ◉ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces 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

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and beverages for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) 5812), and where the land development creates and/or replaces 5,000 square feet or more of impervious surface. ◉ Yes ○ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ○ Yes ◉ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ◉ Yes ○ No

6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ◉ Yes ○ No

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7. **New development or redevelopment discharging directly to an environmentally sensitive area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over the project site), and discharges 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). ○ Yes ◉ No

8. **New development or redevelopment projects of retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ○ Yes ◉ No

9. **New development or redevelopment projects of an automotive repair shop that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534 or 7536-7539. ○ Yes ◉ No

10. **Other Pollutant Generating Project.** These projects are not covered in any of the categories above but involve the disturbance of one or more acres of land and are expected to generate post-construction phase pollutants, including fertilizers and pesticides. This category does not include projects creating less than 5,000 square feet of impervious area and projects containing landscaping without a requirement for the regular use of fertilizers and pesticides (such as a slope stabilization project using native plants). Impervious area calculations need not include linear pathways for infrequent vehicle use, such as emergency maintenance access or bicycle and pedestrian paths if the linear pathways are built with pervious surfaces or if runoff from the pathway sheet flows to adjacent pervious areas. ◉ Yes ○ No

PART F – Select the appropriate category based on the outcomes of Part C through Part E

1. The project is **NOT SUBJECT TO PERMANENT STORMWATER REQUIREMENTS** ○ Yes ○ No
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Stormwater Standards Manual for guidance. ○ Yes ○ No
3. The Project is **PDP EXEMPT**. Site design and source control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance. ○ Yes ○ No
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control and structural pollutant control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance on determining if the project requires hydromodification plan management. ◉ Yes ○ No

Mel Landy	PE
Name of Owner or Agent	**Title**
[signature]	04/25/2022
Signature	**Date**

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Applicability of Permanent, Post-Construction Storm Water BMP Requirements		Form I-1
Project Identification		
Project Name: Clairemont Village Quad		
Permit Application Number: 697307		Date: 9.15.21
Determination of Requirements		
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.		
Step	**Answer**	**Progression**
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop.** Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Project Name: Clairemont Village Quad

Form I-1 Page 2 of 2		
Step	**Answer**	**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to **Step 4**.
	☑ No	BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (not required if prior lawful approval does not apply):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **Step 5**.
	☐ No	**Stop**. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do not apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). **Stop**.
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **Stop**.
Discussion / justification if protection of critical coarse sediment yield areas does not apply:		

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody. Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

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Project Name: Clairemont Village Quad

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Clairemont Village Quad
Project Address	3007 Clairemont Dr
Assessor's Parcel Number(s) (APN(s))	425-680-10-00
Permit Application Number	
Project Watershed	Select One: ☐ San Dieguito River ☑ Penasquitos ☐ Mission Bay ☐ San Diego River ☐ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Miramar 906.40 and Tecolote 906.50
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	12.96 Acres (564,538 Square Feet)
Area to be disturbed by the project (Project Footprint)	2.16 Acres (94,090 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	2.07 Acres (90,241 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.09 Acres (3,920 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	0 %

Project Name: Clairemont Village Quad

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☑ Existing development ☐ Previously graded but not built out ☐ Agricultural or other non-impervious use ☐ Vacant, undeveloped/natural Description / Additional Information: The current existing project site is comprised of parking lots
Existing Land Cover Includes (select all that apply): ☐ Vegetative Cover ☐ Non-Vegetated Pervious Areas ☑ Impervious Areas Description / Additional Information: Ac Pavement
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: ☐ Groundwater Depth < 5 feet ☐ 5 feet < Groundwater Depth < 10 feet ☐ 10 feet < Groundwater Depth < 20 feet ☑ Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐ Watercourses ☐ Seeps ☐ Springs ☐ Wetlands ☑ None Description / Additional Information:

Project Name: Clairemont Village Quad

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage
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. If runoff from offsite is conveyed through the site? If yes, quantification of 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 storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the 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.
Descriptions/Additional Information
There are 3 POCs for the Project Area (pl to pl) as shown on the DMA and HMP exhibits. For purposes of this SWQMP, POC 1 which is associated with the "project footprint" watershed will be analyzed for Water Pollution and Hydromodification Management. 1. The existing drainage conveyance is urban 2. There is no off-site runoff conveyed through the project site. The proposed project site will not incur any off site run-on. 3. The onsite overland drainage to be analyzed for the proposed development is part of a bigger drainage area, which consists of several subareas such as: rooftops and partial rooftop footprints of the existing structures to the north and northwest, a portion of the AC parking lot on the west side of these structures that routes to an existing drainage inlet located in front of Sprouts (which ties back into the existing underground storm drain system routing southerly to the project's point of compliance), the existing concrete driveway located behind sprouts, the entire larger existing AC paved parking lot at the east side of the property boundary where the proposed apartment complex will be located, and the existing landscaped slope located along the Northeasterly property line. The general drainage pattern of the site can be simplified into two main directions of flow. The westerly drainage subareas either sheet flow or pipe flow easterly into a series of existing surface level drainage inlets located from North to South along the existing larger easterly AC parking lot. The easterly portions of the drainage subareas located along Cowley Way and the northeasterly property line sheet flow westerly to the same series of existing surface level drainage inlets located from North to South along the existing larger easterly AC parking lot. The entire tributary drainage area for this project flows southerly to the existing curb inlet located at the southerly corner of the existing AC paved parking lot. This existing curb inlet is located directly adjacent to the northwest curb return of the of the intersection of Field Street and Cowley Way. Flows are routed to this existing curb inlet via surface drainage as well as existing underground storm drain piping. 4.0 This existing curb inlet location acts as the point of confluence for this project and will be utilized to compare post -development flows to pre-development flows.

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The proposed land use is a mixed-use building complex which includes 9 levels of low income housing with one retail on ground floor. The proposed project will include an pcc concrete paved parking lot, on-site concrete sidewalks/ ramps,associated landscaping planters, and public improvements. The public improvements will be decorative sidewalks along the east side of the property.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): The proposed concrete asphalt parking lot and building will take up the majority of the project disturbance area. Along with the parking lot there will be concrete sidewalks/ramps for pedestrian use. Decorative concrete is being proposed along the side of the building.
List/describe proposed pervious features of the project (e.g., landscape areas): The proposed pervious features on-site will include landscaping planters within the roof top and decks of the proposed building.
Does the project include grading and changes to site topography? ☑ Yes ☐ No Description / Additional Information: The proposed parking lot at ground level will be required.

Form I-3B Page 5 of 11
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 and 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. Description / Additional Information: Under post development conditions, the westerly drainage existing subareas either sheet flow or pipe flow easterly via a series of roof drains or existing surface level drainage inlets and existing storm drain piping. The westerly drainage will be picked up by a proposed length of underground storm drain piping that runs from the northerly corner of the site in front of rite-aid, to the northerly end of the existing concrete driveway at the central portion of the site. At this location, the proposed storm drain pipe run will tie into an existing preserved drainage inlet and then runoff will continue out to the the ultimate discharge point/point of confluence for the site at the corner of Cowley Way and Field Street via existing 24" storm drain pipes. The main difference in drainage pattern under post development conditions, is runoff that is collected on the rooftops of the proposed structure being constructed in the rear AC parking lot, will now be diverted and routed into a series of biofiltration planters located along the sides of the building. These planters will treat the runoff, and discharge the stormwater collected from the proposed building northerly via a proposed discharge pipe. This pipe will route the stormwater captured from the structure footprint into a hydromodification storage vault located beneath the AC surface at the northerly corner of the site as shown on the post-development hydrology map. Runoff captured from the disturbed street level areas will be routed to proposed modular wetland systems (MWS) . These MWS will treat the runoff and then discharge the runoff to the same northerly hydromodification storage vault. Once runoff is detained from both this tributary area and the larger tributary area of the proposed structure's footprint, the storage vault will discharge the runoff at controlled rates via an 18" proposed storm drain outlet pipe that will route southwesterly, parallel to the other proposed storm drain that is picking up all the runoff from the existing westerly portions of the site. These two proposed storm drains will tie together at a proposed inlet and the combined flow will route into one more reach of proposed 18" pipe. This last reach of proposed piping ties into the existing preserved drainage inlet previously mentioned and runoff is then carried off to the ultimate discharge point/point of confluence located at the existing curb inlet at the southerly corner of the project site. Due to the increase in overall stormwater flow length to the point of compliance as discussed above, there will be an increase in Time of Concentration. However, the general overall drainage pattern will be preserved under post development conditions.

Project Name: Clairemont Village Quad

Form I-3B Page 6 of 11
Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply): ☑Onsite 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 Description/Additional Information:

Project Name: Clairemont Village Quad

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) All runoff from the on-site POC will travel south via an underground pipe that discharges into Tecolote Creek and ultimately discharge into Mission Bay
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations San Diego River (lower) existing beneficial use: REC 1 & 2, WARM, WILD, RARE
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations Not applicable
Provide distance from project outfall location to impaired or sensitive receiving waters San Diego River (lower) - 1.5 miles
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands Not applicable. The City's Multi Habitat Planning Area and Environmentally Sensitive lands are not within the proximity of the project site.

Project Name: Clairemont Village Quad

Form I-3B Page 8 of 11		
Identification of Receiving Water Pollutants of Concern		
List any 303(d) impaired water bodies 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 (Refer to Appendix K)	**Pollutant(s)/Stressor(s) (Refer to Appendix K)**	**TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)**
Mission Bay	Eutrophic	Indicator Bacteria.
(area at mouth of Tecolote Creek only)	Lead	
Tecolote Creek	Cadmium, Copper	Indicator Bacteria.
	Indicator Bacteria, Lead	
	Nitrogen, Phosphorus	
	Selenium, Toxicity	
	Turbidity, Zinc	

Identification of Project Site Pollutants*

*Identification of project site pollutants 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 anticipated from the project site based on all proposed use(s) of the site (see 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	☐	☐	☐
Oil & Grease	☐	☐	☐
Bacteria & Viruses	☐	☐	☐
Pesticides	☐	☐	☐

Project Name: Clairemont Village Quad

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6)? ☑ Yes, hydromodification management flow control structural BMPs required. ☐ 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 for the watershed in which the project resides. Description / Additional Information (to be provided if a 'No' answer has been selected above): Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.
Critical Coarse Sediment Yield Areas* ***This Section only required if hydromodification management requirements apply**
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ☐ Yes ☑ No Discussion / Additional Information: Per section 6.2 of Appendix H, CCSYA does not appear to exist on the project footprint. Additionally, the project site is contained and does not receive upstream areas draining through the project footprint.

Form I-3B Page 10 of 11
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. There are 3 POCs for the Project Area (pl to pl) as shown on the DMA and HMP exhibits. For purposes of this SWQMP, POC 1 which is associated with the "project footprint" watershed will be analyzed for Water Pollution and Hydromodification Management. The point of compliance (POC # 1) will occur downstream of the proprietary Biofiltration MWS unit and the underground storage system. An overflow structure will be constructed as part of the underground system with a weir wall and orifice to meet HMP compliance.
Has a geomorphic assessment been performed for the receiving channel(s)? ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold) ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11
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. Not applicable
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.

Source Control BMP Checklist for PDPs			Form I-4B
Source Control BMPs			
All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) 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 and/or Appendix E of the 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 may 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:			
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:			

Project Name: Clairemont Village Quad

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☑ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☑ Yes	☐ No	☐ N/A
Interior parking garages	☑ Yes	☐ No	☐ N/A
Need for future indoor & structural pest control	☑ Yes	☐ No	☐ N/A
Landscape/Outdoor Pesticide Use	☑ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☑ Yes	☐ No	☐ N/A
Food service	☑ Yes	☐ No	☐ N/A
Refuse areas	☐ Yes	☐ No	☑ N/A
Industrial processes	☐ Yes	☐ No	☑ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☑ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☑ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☑ N/A
Loading Docks	☐ Yes	☐ No	☑ N/A
Fire Sprinkler Test Water	☑ Yes	☐ No	☐ N/A
Miscellaneous Drain or Wash Water	☑ Yes	☐ No	☐ N/A
Plazas, sidewalks, and parking lots	☑ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☑ No	☐ N/A
SC-6B: Animal Facilities	☐ Yes	☑ No	☐ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☑ No	☐ N/A
SC-6D: Automotive Facilities	☐ 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 all "No" answers shown above.			

Project Name: Clairemont Village Quad

Site Design BMP Checklist for PDPs			Form I-5B
Site Design BMPs			
All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) 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 and/or Appendix E of the 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 may be provided. A site map with implemented site design BMPs must be included at the end of this checklist.			
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:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☑ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.2 not implemented:			

Project Name: Clairemont Village Quad

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.3 not implemented: The project will be adding a building over existing impervious areas.			
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: Impervious area dispersion requires a minimum width of 10 feet of pervious area as well as a maximum slope of 5 percent, The proposed footprint and existing conditions of the site could not accomplish the implementation of impervious are dispersion.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☐ No	☑ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☐ No	☑ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Clairemont Village Quad

Form I-5B Page 3 of 4			
Site Design Requirement	**Applied?**		
4.3.6 Runoff Collection	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix	☐ Yes	☐ No	☑ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: Harvest and Use was found to be infeasible. See the attached Harvest and Use worksheet.			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Clairemont Village Quad

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:

Project Name: Clairemont Village Quad

Summary of PDP Structural BMPs	Form I-6
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). 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 City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual). Use this form 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 (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).	
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. The project proposes the use of proprietary Biofiltration BMPs (Modular Wetland System), planter boxes and a below ground storage system. These devices have been sized per the City of San Diego storm water worksheets and comply with treatment and flow sizing requirements. A concrete box with a weir wall and orifice have been proposed to comply with flow control requirements. (Continue on page 2 as necessary.)	

Form I-6 Page 1 of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. **MWS-1**	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD
Who will be the final owner of this BMP?	TBD
Who will maintain this BMP into perpetuity?	TBD
What is the funding mechanism for maintenance?	PRIVATE

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. **MWS-1**
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Runoff will then be routed to a proposed proprietary Biofiltration BMP consisting of an BioClean Modular Wetland System (MWS) for treatment. The MWS has been sized to comply with the treatment control requirements.

Form I-6 Page 1 of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. MWS-2	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD
Who will be the final owner of this BMP?	TBD
Who will maintain this BMP into perpetuity?	TBD
What is the funding mechanism for maintenance?	PRIVATE

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. **MWS-2**
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Runoff will then be routed to a proposed proprietary Biofiltration BMP consisting of an BioClean Modular Wetland System (MWS) for treatment. The MWS has been sized to comply with the treatment control requirements.

Form I-6 Page 1 of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. UG-1	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD
Who will be the final owner of this BMP?	TBD
Who will maintain this BMP into perpetuity?	TBD
What is the funding mechanism for maintenance?	PRIVATE

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. **UG-1**
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Runoff from all new and replaced impervious areas will be routed to a STORM CHAMBER system for Hydromodification Compliance.

Form I-6 Page 1 of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. **BMP-1**	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD
Who will be the final owner of this BMP?	TBD
Who will maintain this BMP into perpetuity?	TBD
What is the funding mechanism for maintenance?	PRIVATE

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. **BMP-1**
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Runoff from building roof tops and higher level decks will be routed to proposed planter boxes along the edges of the building.

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: Clairemont Village Quad

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☑ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☑ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs

Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition:
	• No Infiltration Condition:
	  ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***)
	  ○ Form I-8A (optional)
	  ○ Form I-8B (optional)
	• Partial Infiltration Condition:
	  ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***)
	  ○ Form I-8A
	  ○ Form I-8B
	• Full Infiltration Condition:
	  ○ Form I-8A
	  ○ Form I-8B
	  ○ Worksheet C.4-3
	  ○ Form I-9
	Refer to Appendices C and D of the BMP Design Manual for guidance.
		☑ Included
		
		☐ Not included because the entire project will use harvest and use BMPs

Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

Attachment 1a:

DMA Exhibit

Project Name: Clairemont Village Quad

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 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 Form I-3B)
- ☑ Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)

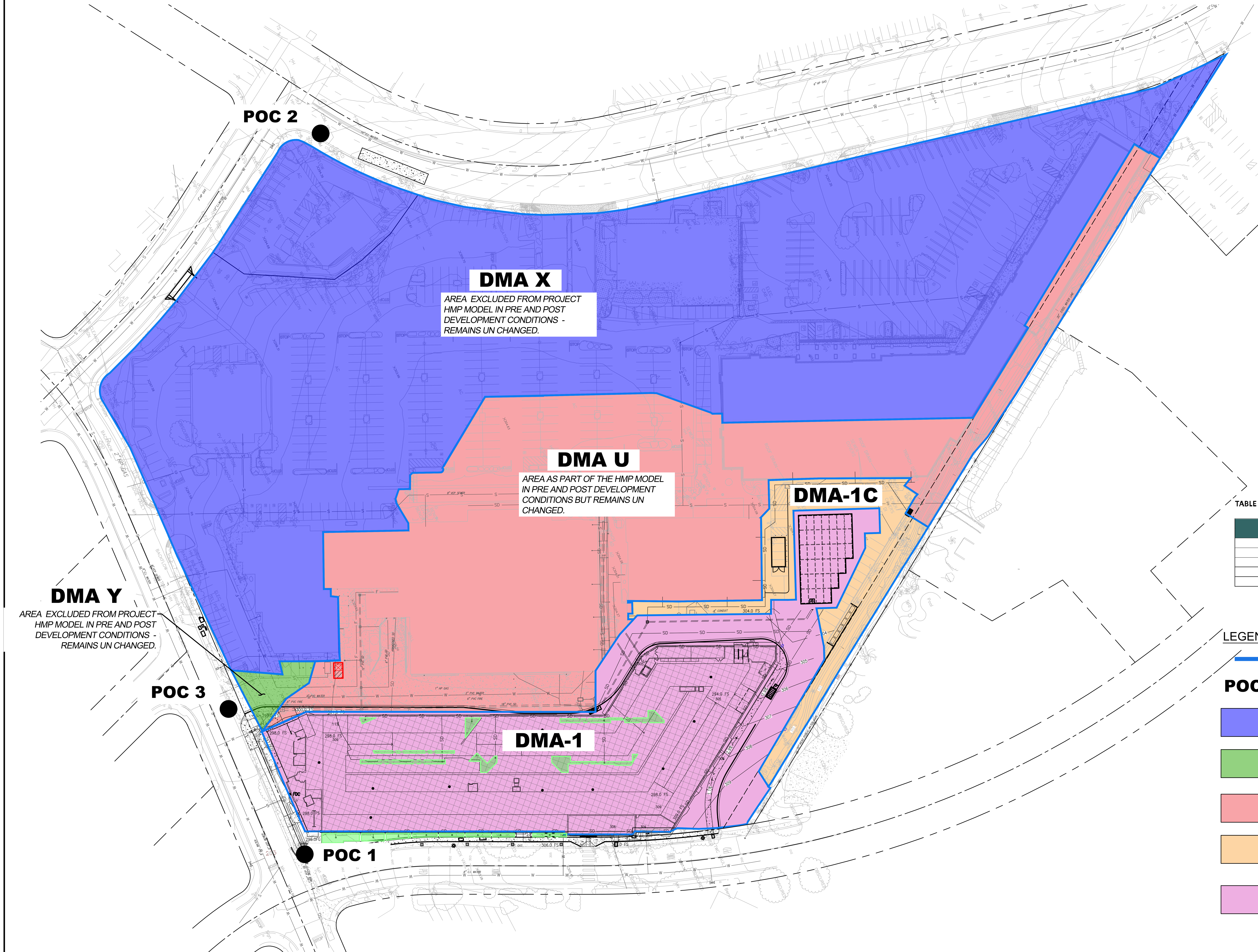


TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%
DMA-X	6.800	90.0%
DMA-Y	0.069	90.0%

LEGEND

- DRAINAGE MANAGEMENT AREA (DMA)
- **POC 1** ● POINT OF COMPLIANCE
- EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 2
- EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 3
- EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1
- EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)
- NEW/REPLACED AREAS IN POST DEVELOPMENT CONDITIONS (PERVIOUS & IMPERVIOUS) DRAINS TO POC 1

DMA MAP

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

DATE: 08/25/22	DRAWING: SHEET 1 OF 1

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%
DMA (Subsequent from DMAs 1 & DMA-1C	**Tributary Area, A (Ac)**	**Impervious Percentage, Ip**
DMA-1(bldg)	1.560	92.3%
DMA-1a	0.863	92.3%
DMA-1b	0.204	88.2%

NOTES:

1. THE UNDERLYING SOIL TYPE GROUPS "B" FOR THE ENTIRE PROPERTY AND SURROUNDING PARCELS
2. THE APPROXIMATE DEPTH TO GROUND WATER IS EXPECTED TO BE MORE THAN 15 FEET.
3. NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED BASED ON WMAA MAPS(SEE PROJECT SWQMP).
4. THE SITE DOES NOT CONTAIN ANY EXISTING NATURAL HYDROLOGIC FEATURES. (WATERCOURSES, SEEPS, SPRINGS, WETLANDS.

EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1

EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)

NEW/REPLACED AREAS IN POST DEVELOPMENT CONDITIONS (PERVIOUS & IMPERVIOUS) DRAINS TO POC 1

BUILDING AREAS (1.5 AC) DRAIN TO SIDE PLANTERS / HMP/ DRAINS TO POC 1

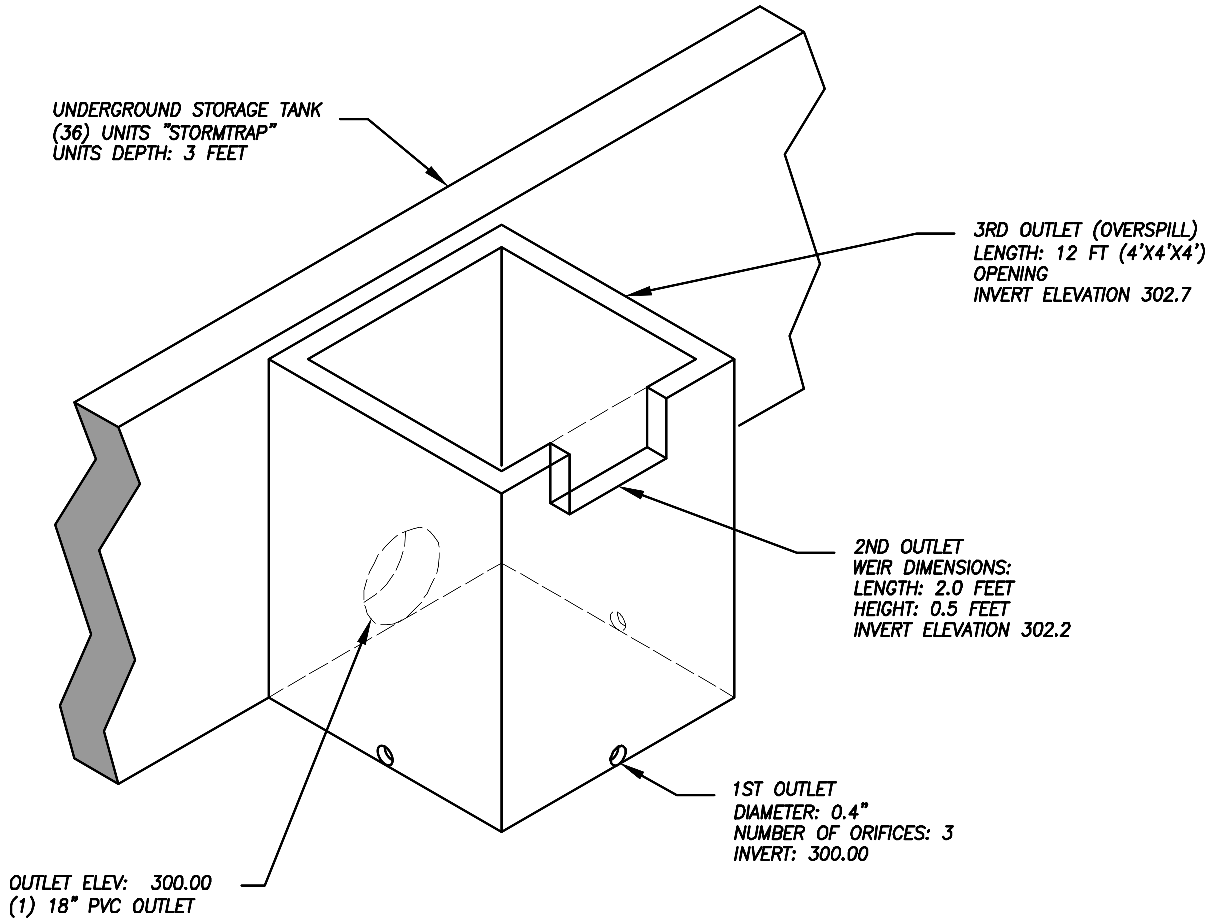
DMA MAP

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

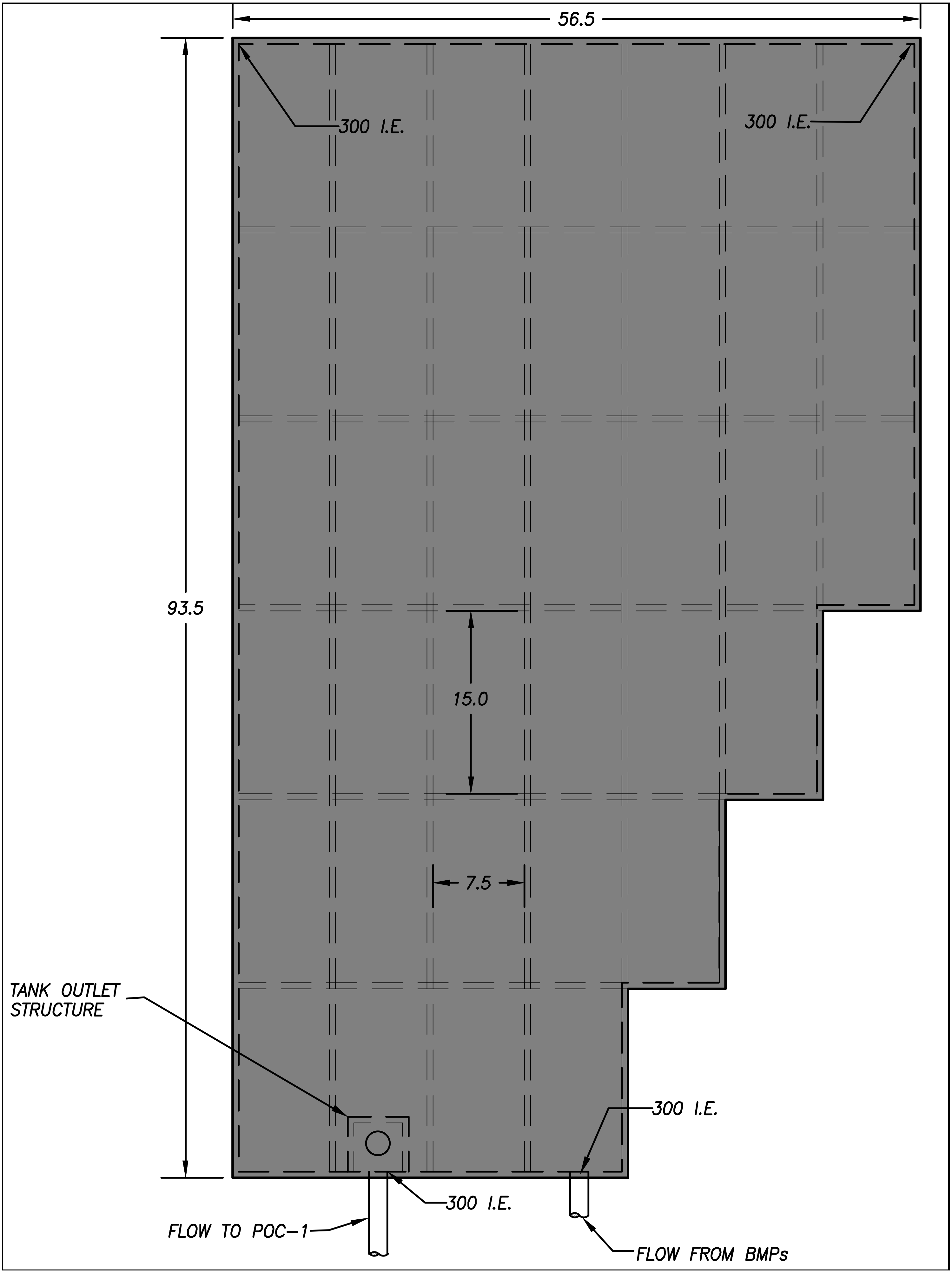
DATE: 08/25/22

DRAWING:

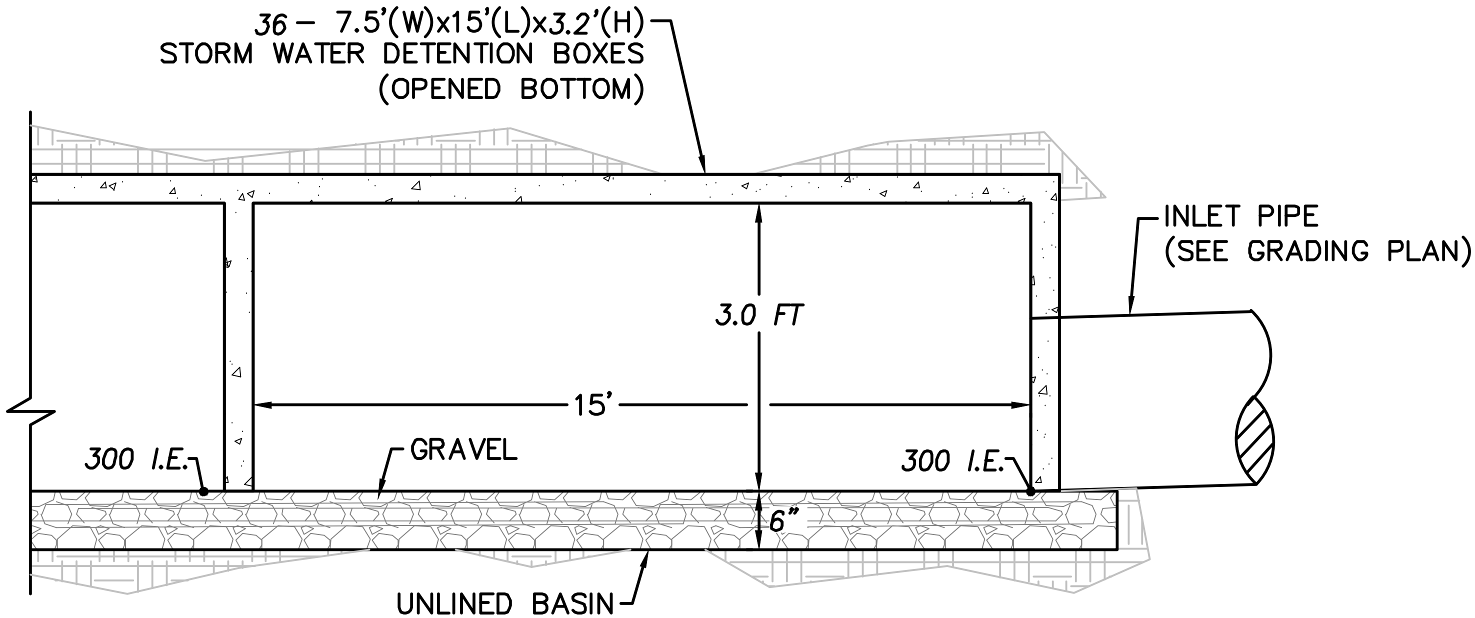
SHEET 1 OF 1



OUTLET DETAIL
NTS



56.5
93.5
300 I.E.
300 I.E.
15.0
7.5
TANK OUTLET
STRUCTURE
300 I.E.
300 I.E.
FLOW TO POC-1
FLOW FROM BMPs



SECTION A-A: UNDERGROUND DETENTION BASIN

NTS

Attachment 1b:

Tabular Summary of DMAs (Worksheet B-1 from Appendix B) and Design Capture Volume Calculations

Project Name: Clairemont Village Quad

Tabular Summary of DMAs							Worksheet B-1		
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
DMA-U	3.265	2.939	90	B	.84	N/A	NA	NA	POC-1
DMA-1(bldg	1.560	1.440	92.3	B	.88	2,591	Planters	BIO-Filtration	POC-1
DMA-1a	0.397	0.397	100	B	.90	679	MWS	BIO-Filtration	POC-1
DMA-1b	0.204	0.180	88.2	B	.87	328	MWS	BIO-Filtration	POC-1
DMA-1c	0.466	0.430	92.3	B	.88	781	MWS	BIO-Filtration	POC-1
Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
4 (DMA-U EXCLUDED)	2.63	2.45	93.2		.88	4379	2.63		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

Worksheet B.2-1: DCV
DMA 1(BLDG)

	Design Capture Volume	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	[illegible]	inches
2	Area tributary to BMP (s)	A=	1.56	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	[illegible]8	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	[illegible]	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	2,591	cubic-feet

Worksheet B.2-1: DCV
DMA 1a

	Design Capture Volume	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	[illegible]	inches
2	Area tributary to BMP (s)	A=	0.40	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.90	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	[illegible]	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	679.5	cubic-feet

Worksheet B.2-1: DCV
DMA 1b

	Design Capture Volume	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	[illegible]	inches
2	Area tributary to BMP (s)	A=	0.20	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	[illegible]7	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	[illegible]	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	328.4	cubic-feet

Worksheet B.2-1: DCV
DMA 1c

	Design Capture Volume	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.52	inches
2	Area tributary to BMP (s)	A=	0.47	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	[illegible]	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	780.7	cubic-feet

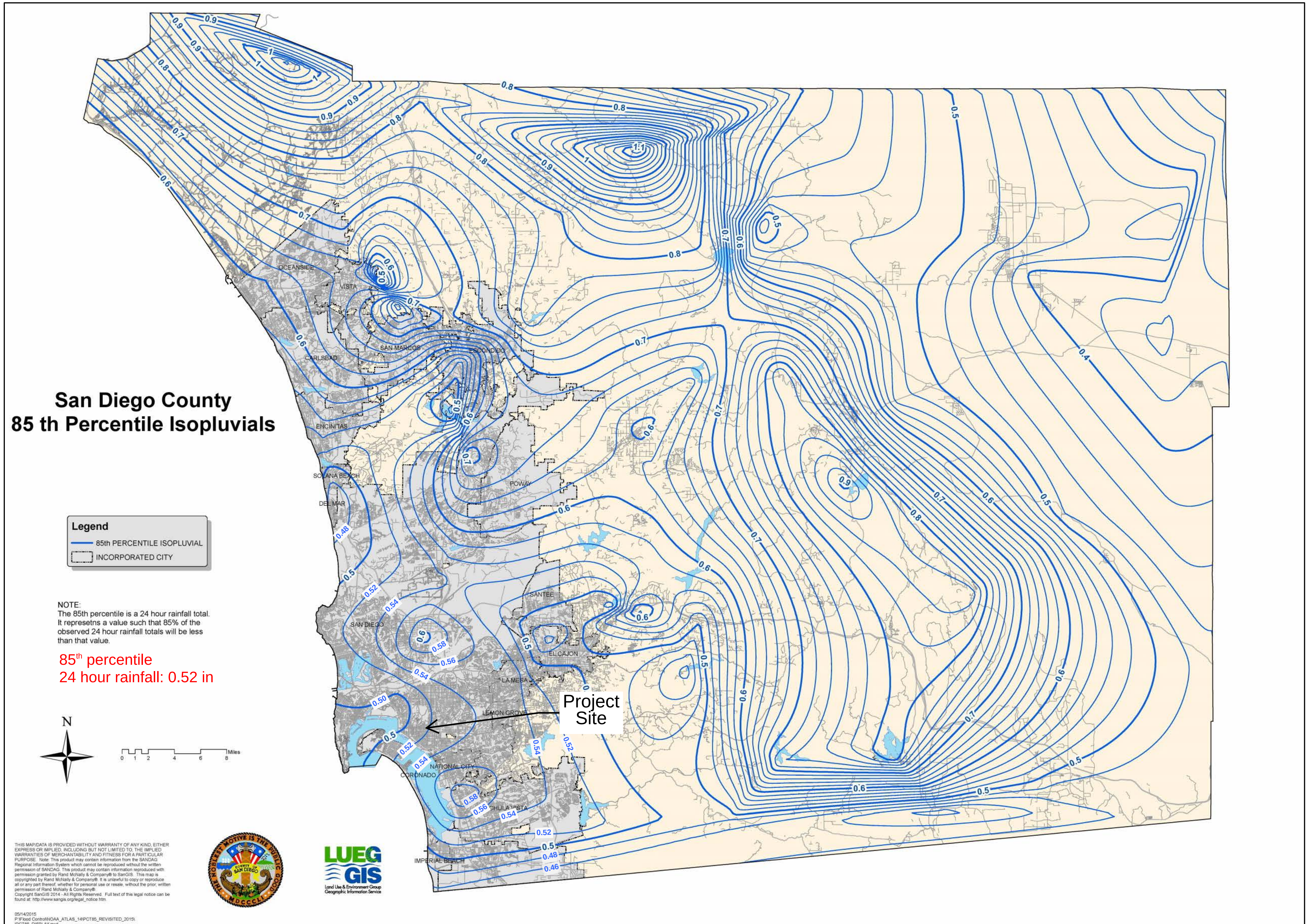


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

Attachment 1c:

Form I-7: Worksheet B.3-1 Harvest and Use Feasibility Screening

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☑ Toilet and urinal flushing
☐ Landscape irrigation
☐ Other:___________

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

[Provide a summary of calculations here]

The anticipated number of residential units: 224 units. Anticipated landscaping areas: 11,00sf

Toilet and urinal flushing demand: 1,239 cf
Irrigation Demand: 74 cf
Total: 1,313 cf

3. Calculate the DCV using worksheet B-2.1.

DCV = 4,379 (cubic feet)

[Provide a summary of calculations here]

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
☐ Yes / ☑ No ⇨	☐ Yes / ☑ No ⇨	☑ Yes
⇩	⇩	⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

Attachment 1d:

Form I-7: Infiltration Feasibility Information: Form I-8A: Worksheet C.4-1 Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
DMA-1		Planning
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ✓ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☐ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ✓ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ✓ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site stormwater design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ✓ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☐ No; full infiltration is not required. Skip to Part 1 Result.
Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I-8A[10]
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

Attachment 1e:

Pollutant Control BMP Design Worksheets/ Calculations

The City of SAN DIEGO	Project Name	CLAIREMONT VILLAGE APARTMENTS	
	BMP ID	BMP 1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	

1	Area draining to the BMP	67954	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.88	
3	85th percentile 24-hour rainfall depth	0.52	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2591	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	0.1	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	0.6	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	15.6	inches
15	Total Depth Treated [Line 13 + Line 14]	16.2	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	3887	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	2879	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	1943	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1495	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	1794	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	1794	sq. ft.
23	Provided BMP Footprint	3200	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO		Project Name	CLAIREMONT VILLAGE APARTMENTS	
		BMP ID	BMP 1	
Sizing Method for Volume Retention Criteria			**Worksheet B.5-2**	
1	Area draining to the BMP		67944	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.88	
3	85^{th} percentile 24-hour rainfall depth		0.52	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]		2591	cu. ft.
Volume Retention Requirement				
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or		0	in/hr.
6	Factor of safety		2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%		3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023		0.023	
10	Target volume retention [Line 9 x Line 4]		60	cu. ft.

The City of SAN DIEGO

	Project Name	UNIVERSITY AVENUE
	BMP ID	BMP 1

Volume Retention for No Infiltration Condition						Worksheet B.5-6
1	Area draining to the biofiltration BMP				67944	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)				0.88	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]				59791	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]				1794	sq. ft.
5	Biofiltration BMP Footprint				3200	sq. ft.
Landscape Area (must be identified on DS-3247)						
	Identification	**1**	**2**	**3**	**4**	**5**
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]				0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]				3200	sq. ft.
Volume Retention Performance Standard						
12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met				
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]				1.78	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]				60	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]				-46.8	cu. ft.
Site Design BMP						
	Identification	**Site Design Type**			**Credit**	
16	1					cu. ft.
	2					cu. ft.
	3					cu. ft.
	4					cu. ft.
	5					cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.				0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met				

SIZING OF PROPRIETARY BIOFILTRATION BMP (MWS)

MWS-1 (DMA 1B)

Design Capture Volume		Worksheet B-2.1		
1	85th Percentile 24-hr storm depth from Figure B.1-1	d=	0.52	inches
2	Areas tributary to BMP(s)	A=	0.20	acres
3	Runoff Factor	C=	0.87	unitless
4	Street Trees Reduction Volume	TCV=	0	cubic-feet
5	Rain Barrels Reduction Volume	RCV=	0	cubic-feet
6	Calculated DCV	DCV=	328.4	cubic-feet

MWS-1 (DMA 1b)

	Flow-thru Design Flows	Worksheet B.6-1		
1	DCV	DCV	328.4	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow-thru (Line 1 - Line 2 - 0.67*Line 3)	$DCV_{flow-thru}$	328.4	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	1	unitless
6	Design rainfall intensity	i=	0.2	in/hr
7	Area tributary to BMP (s)	A=	0.20	acres
8	Runoff Factor	C=	0.87	unitless
9	Calculate Flow Rate = 1.5 AF x (C x i x A)	Q=	0.052	cfs

Modular Wetlands System 4'x4' has a flow treatment rate of 0.052 cfs which exceeds the treatment flow rate calculated above.

MWS-2 (DMA 1a + 1c)

Design Capture Volume		Worksheet B-2.1		
1	85th Percentile 24-hr storm depth from Figure B.1-1	d=	0.52	inches
2	Areas tributary to BMP(s)	A=	0.86	acres
3	Runoff Factor	C=	0.89	unitless
4	Street Trees Reduction Volume	TCV=	0	cubic-feet
5	Rain Barrels Reduction Volume	RCV=	0	cubic-feet
6	Calculated DCV	DCV=	1428.5	cubic-feet

MWS-2 (DMA 1a + 1c)

Flow-thru Design Flows		Worksheet B.6-1		
1	DCV	DCV	1460	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow-thru (Line 1 - Line 2 - 0.67*Line 3)	$DCV_{flow-thru}$	1460	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	1	unitless
6	Design rainfall intensity	i=	0.2	in/hr
7	Area tributary to BMP (s)	A=	0.86	acres
8	Runoff Factor	C=	0.89	unitless
9	Calculate Flow Rate = 1.5 AF x (C x i x A)	Q=	0.229	cfs

Modular Wetlands System 8'x8' has a flow treatment rate of 0.231 cfs which exceeds the treatment flow rate calculated above.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

<table>
<tr><th>Criteria</th><th>Answer</th><th>Progression</th></tr>
<tr><td rowspan="3"><u>Criteria 1 and 3</u>:

What is the infiltration condition of the DMA?

Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.

Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination:
• Infiltration Feasibility Condition Letter; or
• Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B.

Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal</td><td>○ Full Infiltration Condition</td><td>Stop. Compact biofiltration BMP is not allowed.</td></tr>
<tr><td>○ Partial Infiltration Condition</td><td>Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction).

If the required volume reduction is achieved proceed to Criteria 2.

If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. Stop.</td></tr>
<tr><td>◉ No Infiltration Condition</td><td>Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP.

If the criteria in Table B.5-1 is met proceed to Criteria 2.

If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. Stop.</td></tr>
</table>

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

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B[illegible] d B[illegible] r[illegible] d [illegible] d [illegible] A[illegible].

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

[illegible]

[illegible]

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☒ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	☐ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	☐ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

[illegible]:

The MWS Linear has been tested under the Washington State TAPE protocol which is full scale field testing and has received General Use Level Designation under that protocol. Table F.1-1 requires a biofiltration BMP to have Basic Treatment, Phosphorus Treatment, and Enhanced Treatment under this protocol. The MWS Linear has GULD approval for all three and therefore meets this minimum requirement 4. Per Table B.6-1 below the project best fits into the 'commercial development' category. The most significant pollutants of concern for this project are: sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil & grease, and pesticides. Tape approval certification can be found in this Attachment 1e.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

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See response after Form I-10.

Criteria	Answer	Progression
Criteria 6: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	◉ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

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The MWS Linear is a self-contained system with a pre-treatment chamber. Unlike other biofiltration BMPs erosion, scour, and channeling within the BMP is not an issue. The system pre-treatment chamber prevents any erosion or scour. The system downstream orifice control prevents channeling of the media.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
<u>Criteria 7:</u> Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	◉ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

N□□□E□□□□□r□□□r□□□□□□□□

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

The MWS Linear provides activation along with the first year of maintenance and inspection free on all installation in the County of San Diego. Unlike other biofiltration BMPs the City and Co-permitees can be assured the system is being properly installed and maintained. The first year of inspections is used to gauge the amount of loading in the system and this information is used to set appropriate maintenance interval for subsequent years. A copy of the maintenance manual for the MWS Linear is included in Attachment 3.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	◉ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

Provide basis for Criteria 5

Nova Engineering's response:

The MWS Linear an advanced vegetated biofiltration promotes biological processes found in both upland bioretention systems and wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the vegetation root mass. Bacterial growth, supported by the root system in the wetland chamber, performs a number of treatment processes. These vary as a function of moisture, temperature, pH, salinity, and pollutant concentrations. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of vegetation and bacteria, and used for metabolic processes (i.e., energy production and growth). Nitrogen and phosphorus are actively taken up as nutrients that are vital for a number of cell functions, growth, and energy production. These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms.

Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water (Means and Hinchee 1994).

Bacteria can also cause metals to precipitate out as salts, bind them within organic material, and accumulate metals in nodules within the cells. Finally, plant growth may metabolize many pollutants, sequester them or rendering them less toxic (Reeves and Baker 2000).

July 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

- Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

<u>Ecology's Conditions of Use:</u>

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

- Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
- Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
- Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
  - Standing water remains in the vault between rain events, or
  - Bypass occurs during storms smaller than the design storm.
  - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
  - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant: Modular Wetland Systems, Inc.
Applicant's Address: *PO. Box 869*
Oceanside, CA 92054

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

Laboratory Testing

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:
Applicant: Zach Kent
BioClean A Forterra Company.
398 Vi9a El Centro
Oceanside, CA 92058
zach.kent@forterrabp.com

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	**Revision**
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)

TAPE PERFORMANCE SUMMARY

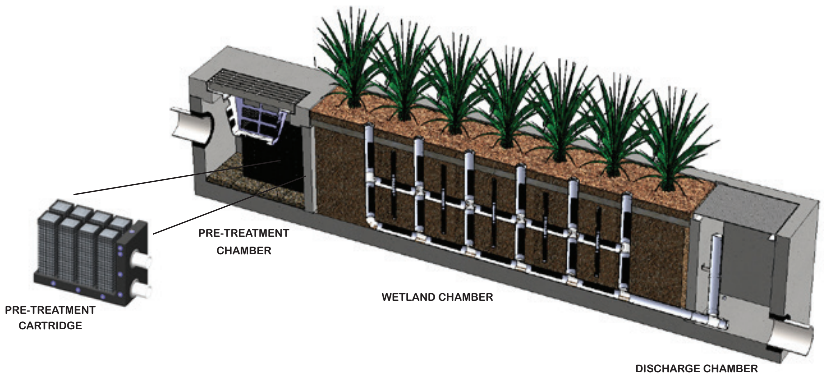
MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.



TAPE PERFORMANCE

Modular Wetland System Linear 2.0 (MWS-L 2.0) completed its TAPE field testing in the spring of 2013. The Washington DOE has approved the system under the TAPE protocol. The MWS-Linear has met the performance benchmarks for the three major pollutant categories as defined by TAPE: Basic Treatment (TSS), Phosphorus and Enhanced (dissolved zinc and copper). It is the first system tested under the protocol to meet the benchmarks for all three categories.

Pollutant	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Total Suspended Solids	75.0	15.7	85%	Summary of all data meeting TAPE parameters pertaining to this pollutant. Mean of 8 microns.
Total Phosphorus	0.227	0.074	64%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Ortho Phosphorus	0.093	0.031	67%	Summary of all data meeting TAPE parameters for total phosphorus.
Nitrogen	1.40	0.77	45%	Utilizing the Kjeldahl method (Total Kjeldahl nitrogen). Summary of all data during testing.
Dissolved Zinc	0.062	0.024	66%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Dissolved Copper	0.0086	0.0059	38%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Total Zinc	0.120	0.038	69%	Summary of all data during testing.
Total Copper	0.017	0.009	50%	Summary of all data during testing.
Motor Oil	24.157	1.133	95%	Summary of all data during testing.

NOTES:
1. The MWS-Linear was proven effective at infiltration rates of up to 121 in/hr.
2. A minimum of 10 aliquots were collected for each event.
3. Sampling was targeted to capture at least 75 percent of the hydrograph.

Modular Wetland System, Inc.
2972 San Luis Rey Rd
Oceanside, CA 92058

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PERFORMANCE SUMMARY

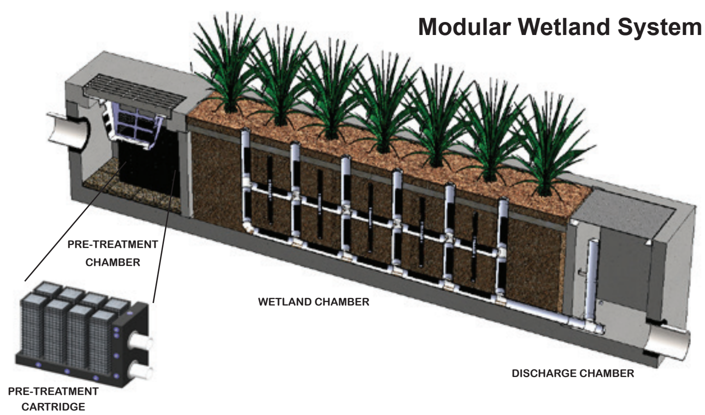
MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.



Modular Wetland System Linear 2.0 (MWS-L 2.0) has been independently tested in laboratory and field conditions since 2008.

Oceanside Test Site

Portland Test Site

HEAVY METALS: Copper / Zinc

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.76 / .95	.06 / .19	92% / 80%	Majority Dissolved Fraction
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.04 / .24	< .02 / < .05	>50% / >79%	Effluent Concentrations Below Detectable Limits
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.058 / .425	.032 / .061	44% / 86%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	.017/ .120	.009 / .038	50% / 69%	Total Metals

TOTAL SUSPENDED SOLIDS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	270	3	99%	Sil-co-sil 106 - 20 micron mean particle size
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	45.67	8.24	82%	Mean Particle Size by Count < 8 Microns
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	676	39	94%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	75.0	15.7	85%	Means particle size of 8 microns

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PERFORMANCE SUMMARY

MWS-LINEAR 2.0

PHOSPHORUS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
TAPE Field Testing / Portland, OR 2011/2012	Field	.227	.074	64%	TOTAL P
TAPE Field Testing / Portland, OR 2011/2012	Field	.093	.031	67%	ORTHO P

BACTERIA:

Description	Type	Avg. Influent (MPN)	Avg. Effluent (MPN)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	1600 / 1600	535 / 637	67% / 60%	Fecal / E. Coli
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	31666 / 6280	8667 / 1058	73% / 83%	Fecal / E. Coli

LEAD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.54	.10	82%	Total
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.01 / .043	.004 / .014	60% / 68%	Both Test Units
TAPE Field Testing / Portland, OR 2011/2012	Field	.011	.003	70%	Total

NITROGEN:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.85	.21	75%	NITRATE
TAPE Field Testing / Portland, OR 2011/2012	Field	1.40	0.77	45%	TKN

HYDROCARBONS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	10	1.625	84%	Oils & Grease
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.83	0	100%	TPH Motor Oil
TAPE Field Testing / Portland, OR 2011/2012	Field	24.157	1.133	95%	Motor Oil

TURBIDITY:

Description	Type	Avg. Influent (NTU)	Avg. Effluent (NTU)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	21	1.575	93%	Field Measurement
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	21	6	71%	Field Measurement

COD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	516 / 1450	90 / 356	83% / 75%	Both Test Units

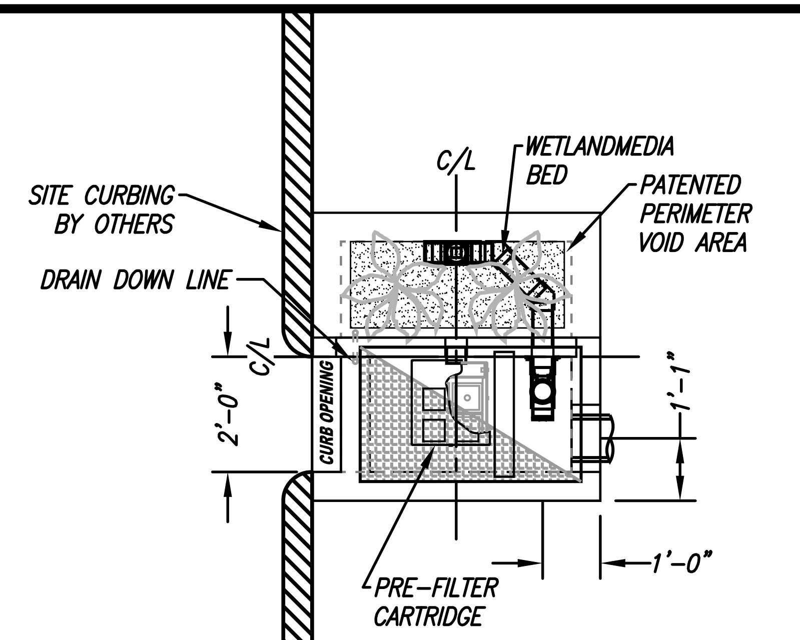
All removal efficiencies and concentrations rounded up for easy viewing. Please call us for more information, including full copies of the reports reference above.

Modular Wetland System, Inc.
2972 San Luis Rey Rd
Oceanside, CA 92058

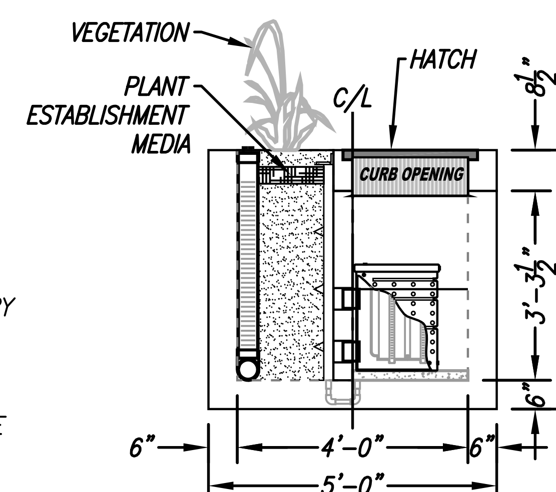
MODULAR WETLANDS
Nature & Technology Working Together In Perfect Harmony™

www.modularwetlands.com
P 760-433-7640
F 760-433-3179

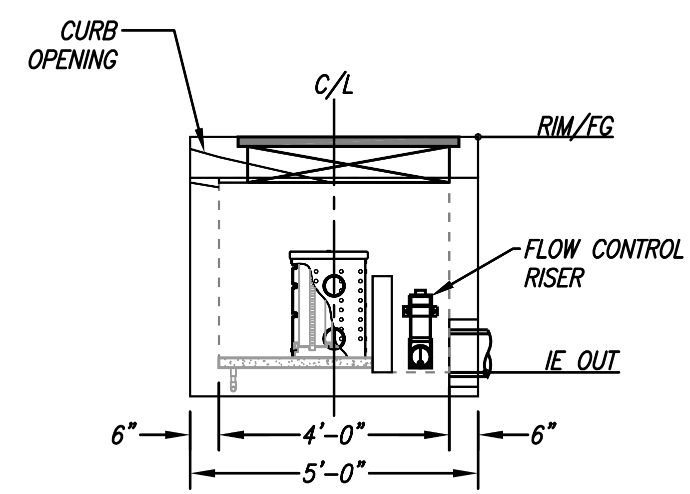
SITE SPECIFIC DATA			
PROJECT NUMBER			
ORDER NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN	OPEN PLANTER	PEDESTRIAN
FRAME & COVER	24" X 42"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			TBD
ORIFICE SIZE (DIA. INCHES)			TBD
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



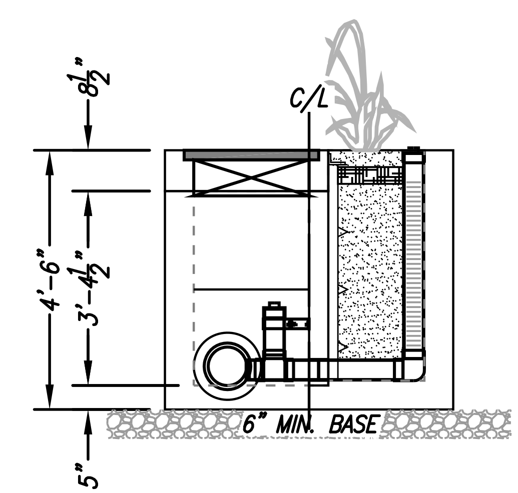
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING MODULAR WETLANDS FOR ACTIVATION OF UNIT. MANUFACTURES WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A MODULAR WETLANDS REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

TREATMENT FLOW (CFS)	0.052
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	1.8
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

Bio Clean
A Forterra Company

MWS-L-4-4-C
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
ORDER NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN	OPEN PLANTER	PEDESTRIAN
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			TBD
ORIFICE SIZE (DIA. INCHES)			TBD
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			

INSTALLATION NOTES

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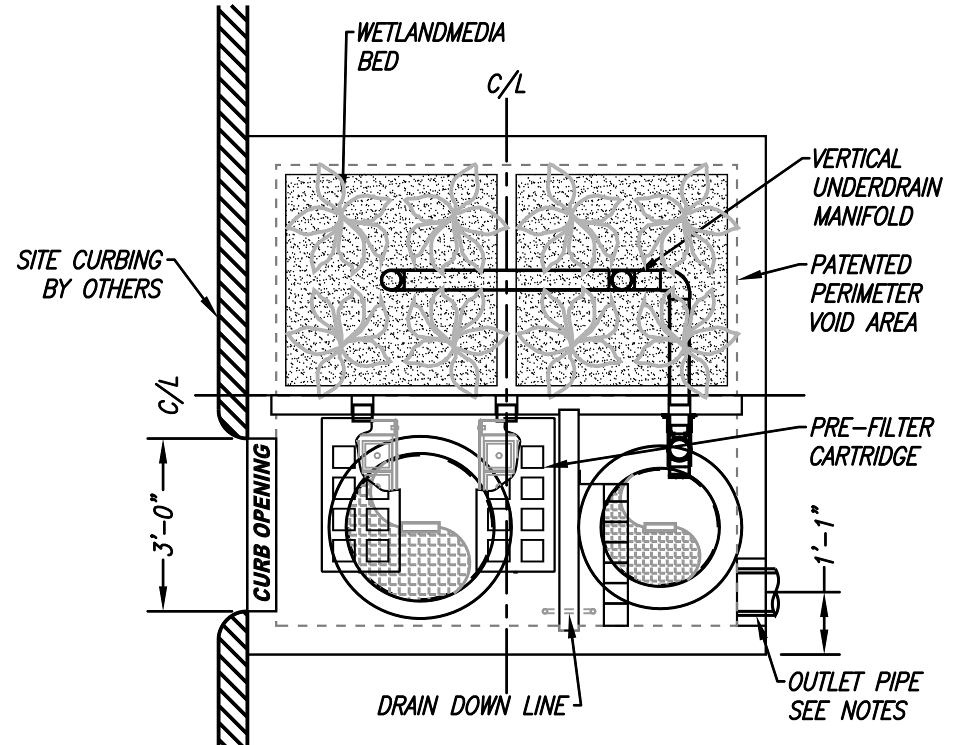
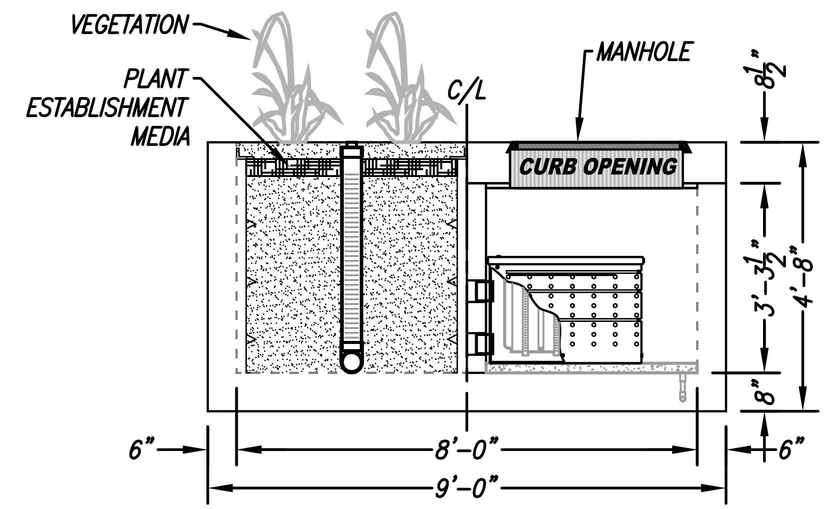
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

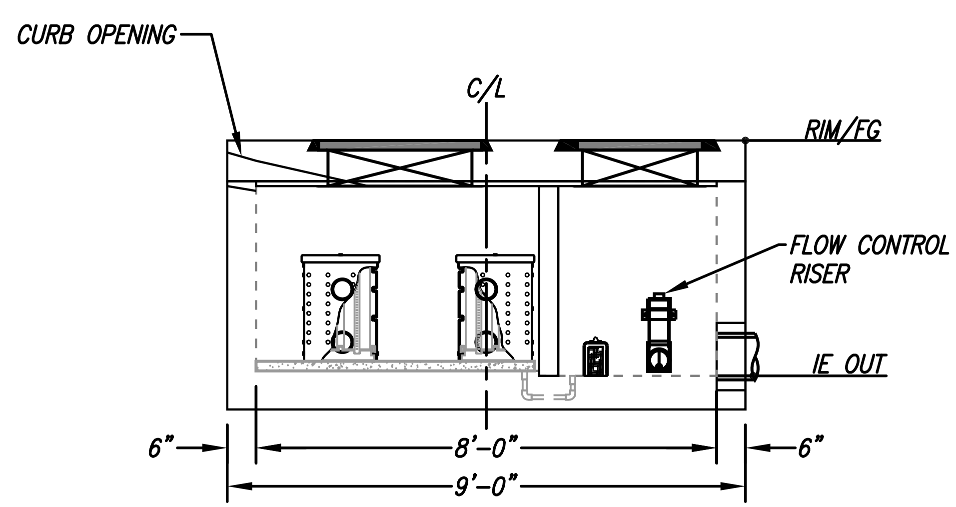
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



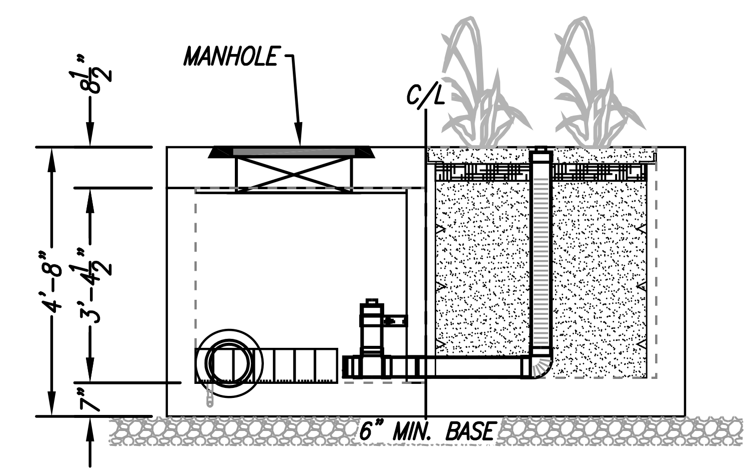
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.231
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

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Bio Clean
A Forterra Company

MWS-L-8-8-C
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

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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.

Project Name: Clairemont Village Quad

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	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 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☑ Included ☐ Submitted as separate stand-alone document

Project Name: Clairemont Village Quad

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 OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
- ☐ 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).

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Attachment 2a:

Hydromodification Exhibit

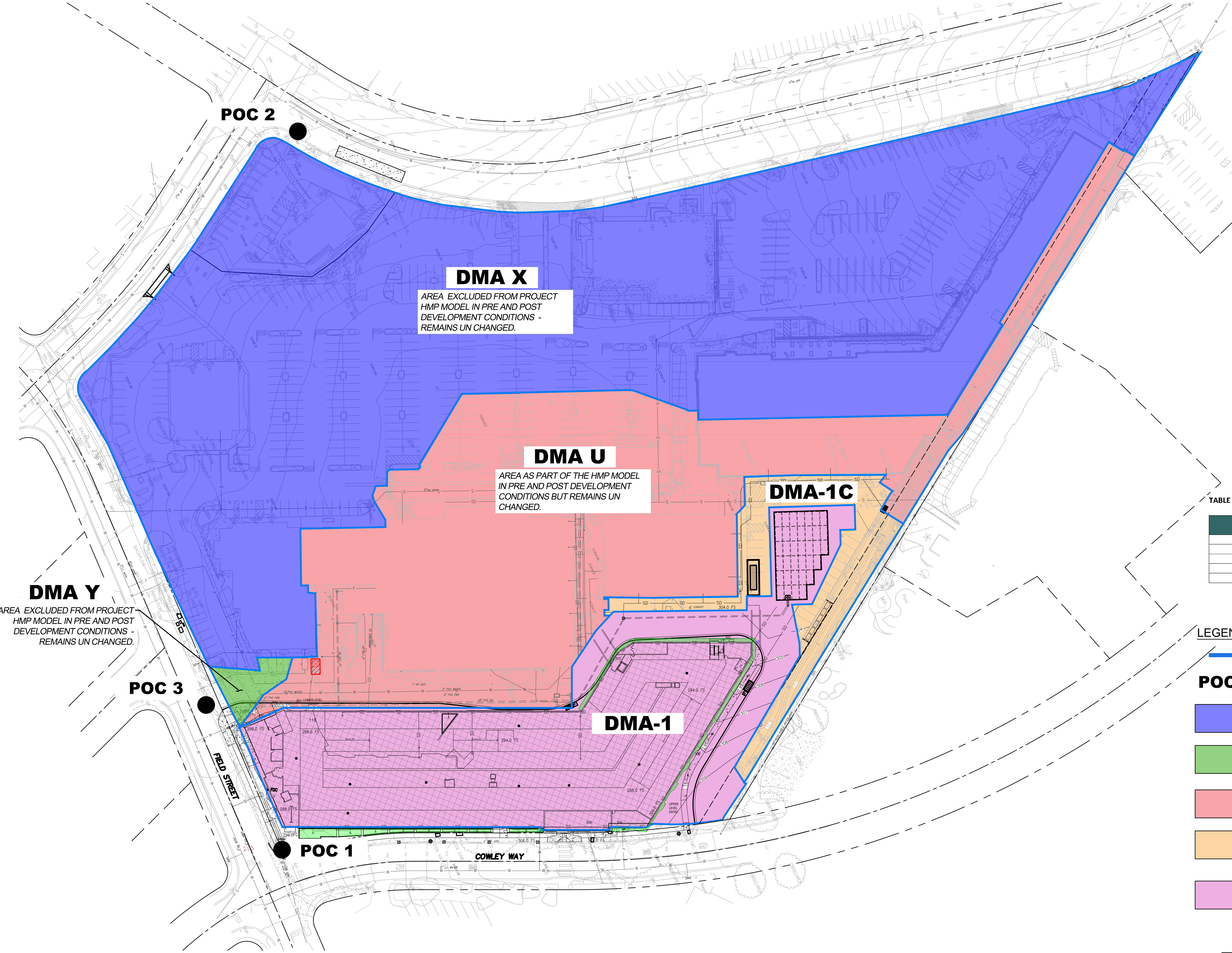


TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%
DMA-X	6.800	90.0%
DMA-Y	0.069	90.0%

LEGEND

DRAINAGE MANAGEMENT AREA (DMA)

POC 1 — POINT OF COMPLIANCE

EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 2

EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 3

EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1

EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)

NEW/REPLACED AREAS IN POST DEVELOPMENT CONDITIONS (PERVIOUS & IMPERVIOUS) DRAINS TO POC 1

HMP POST DEVELOPMENT

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

DATE: 04/25/22

DRAWING: SHEET 1 OF 1

HMP POST DEVELOPMENT

LEGEND

- (blue line) DRAINAGE MANAGEMENT AREA (DMA)
- (arrow) FLOW DIRECTION
- POC 1 (black dot) POINT OF COMPLIANCE
- UG-1 UNDERGROUND SYSTEM
- MWS-# MODULAR WETLAND SYSTEM
- (green hatch) PLANTER AREAS (TREATMENT FOR UPPER LEVELS)
- (P) PROPOSED PIPE

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

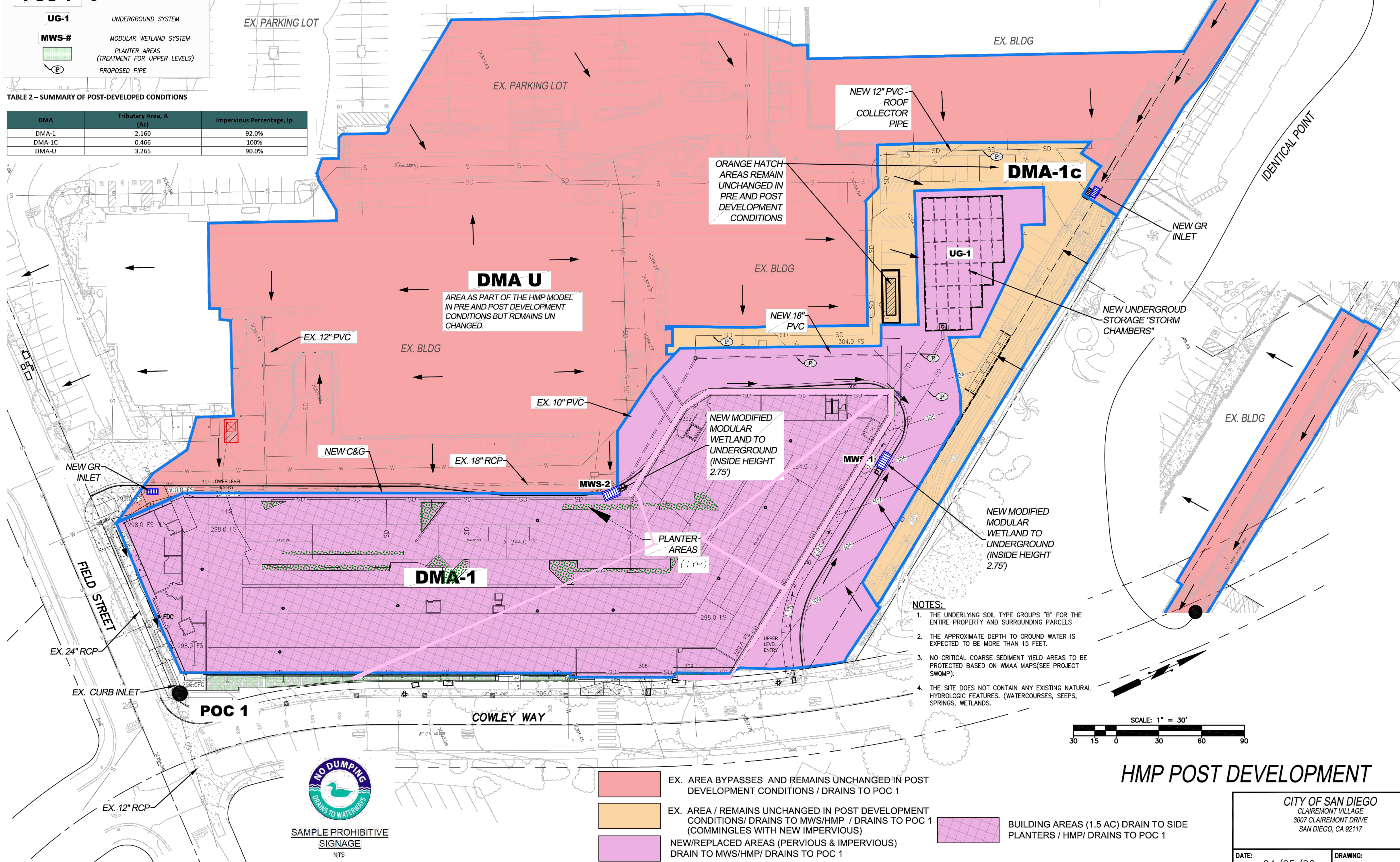
DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%

TABLE 3 – SUMMARY OF DEVELOPED DUAL-PURPOSE BMP

BMP	Tributary Area (Ac)(7)	DIMENSIONS		
		BMP Area(1) (ft²)	VAULT DEPTH (FT)	Total Volume (ft³)
UG-1	2.160	4300	3.2	13,760

TABLE 4 – SUMMARY OF RISER DETAILS

Basin	Lower Orifice		Middle Slot		Upper Weir	
	Diam. (in)	Elev. (ft)	B x h (in)	Elev(1) (ft)	Length(2) (ft)	Elev.(1) (ft)
UG-1	3 x 0.4	0.0	24 x 6	2.20	12	2.70



NOTES:

1. THE UNDERLYING SOIL TYPE GROUPS "B" FOR THE ENTIRE PROPERTY AND SURROUNDING PARCELS
2. THE APPROXIMATE DEPTH TO GROUND WATER IS EXPECTED TO BE MORE THAN 15 FEET.
3. NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED BASED ON WMAA MAPS(SEE PROJECT SWQMP).
4. THE SITE DOES NOT CONTAIN ANY EXISTING NATURAL HYDROLOGIC FEATURES. (WATERCOURSES, SEEPS, SPRINGS, WETLANDS.

NO DUMPING DRAINS TO WATERWAYS

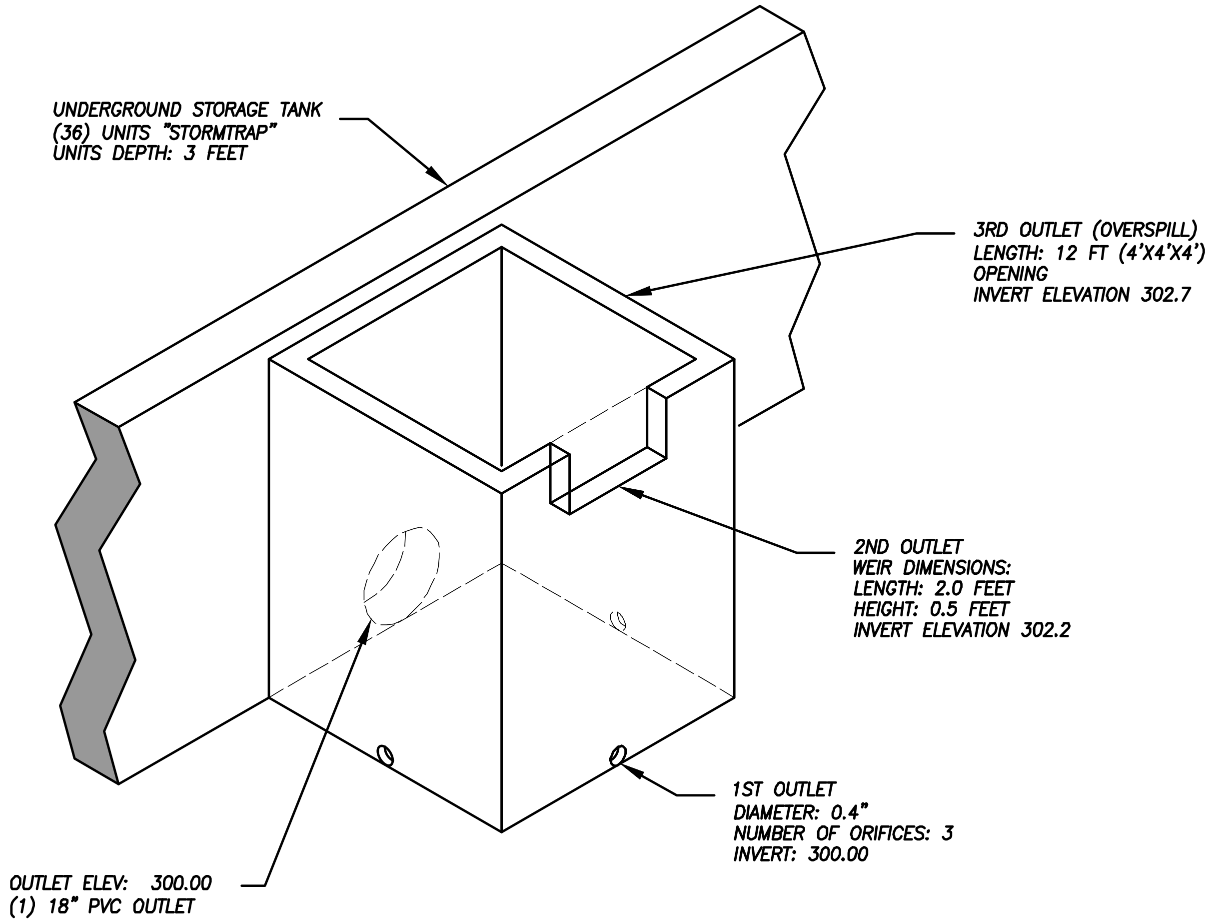
SAMPLE PROHIBITIVE SIGNAGE
NTS

- (red) EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1
- (orange) EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)
- (pink) NEW/REPLACED AREAS (PERVIOUS & IMPERVIOUS) DRAIN TO MWS/HMP/ DRAINS TO POC 1
- (pink hatch) BUILDING AREAS (1.5 AC) DRAIN TO SIDE PLANTERS / HMP/ DRAINS TO POC 1

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

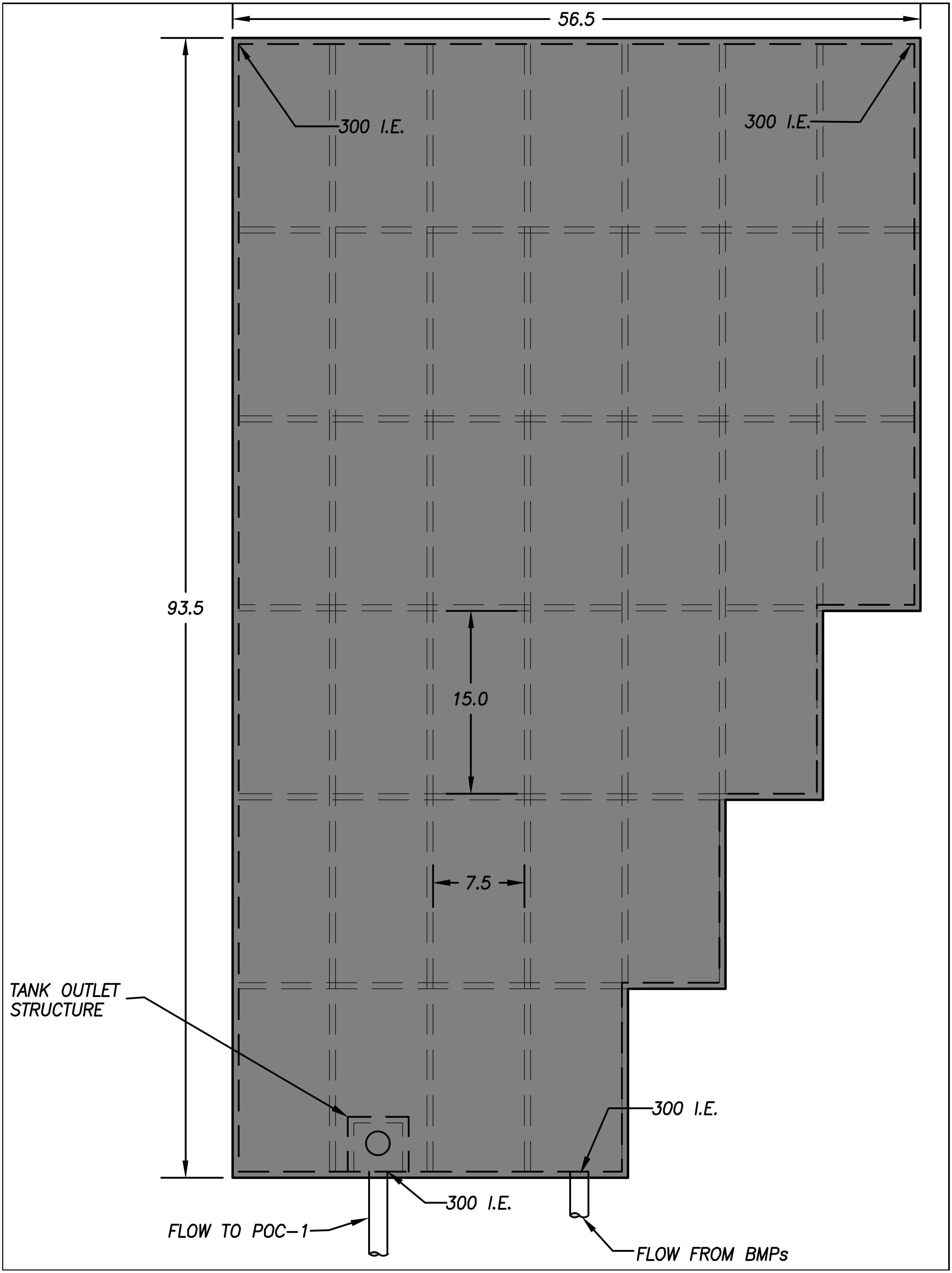
DATE: 04/25/22

DRAWING:
SHEET 1 OF 1

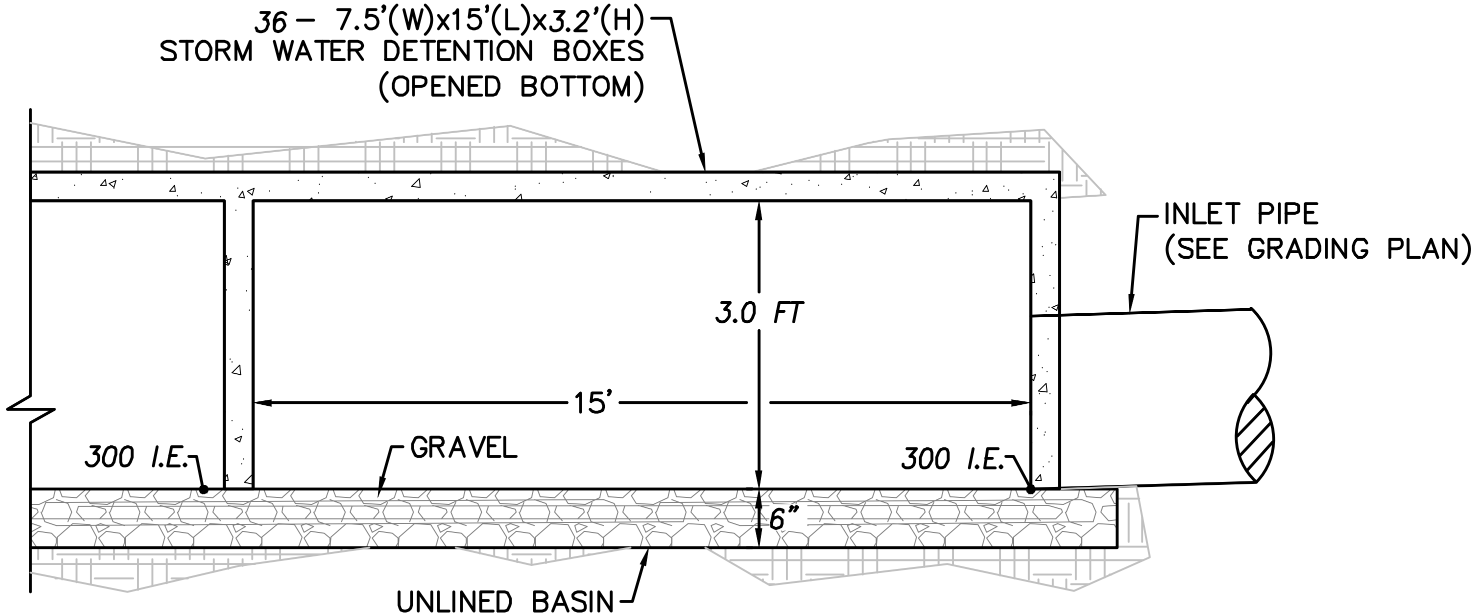


OUTLET DETAIL

NTS



56.5
93.5
300 I.E.
300 I.E.
15.0
7.5
TANK OUTLET STRUCTURE
300 I.E.
300 I.E.
FLOW TO POC-1
FLOW FROM BMPs



SECTION A-A: UNDERGROUND DETENTION BASIN

NTS

Attachment 2b:

Management of Critical Coarse Sediment Yield Areas

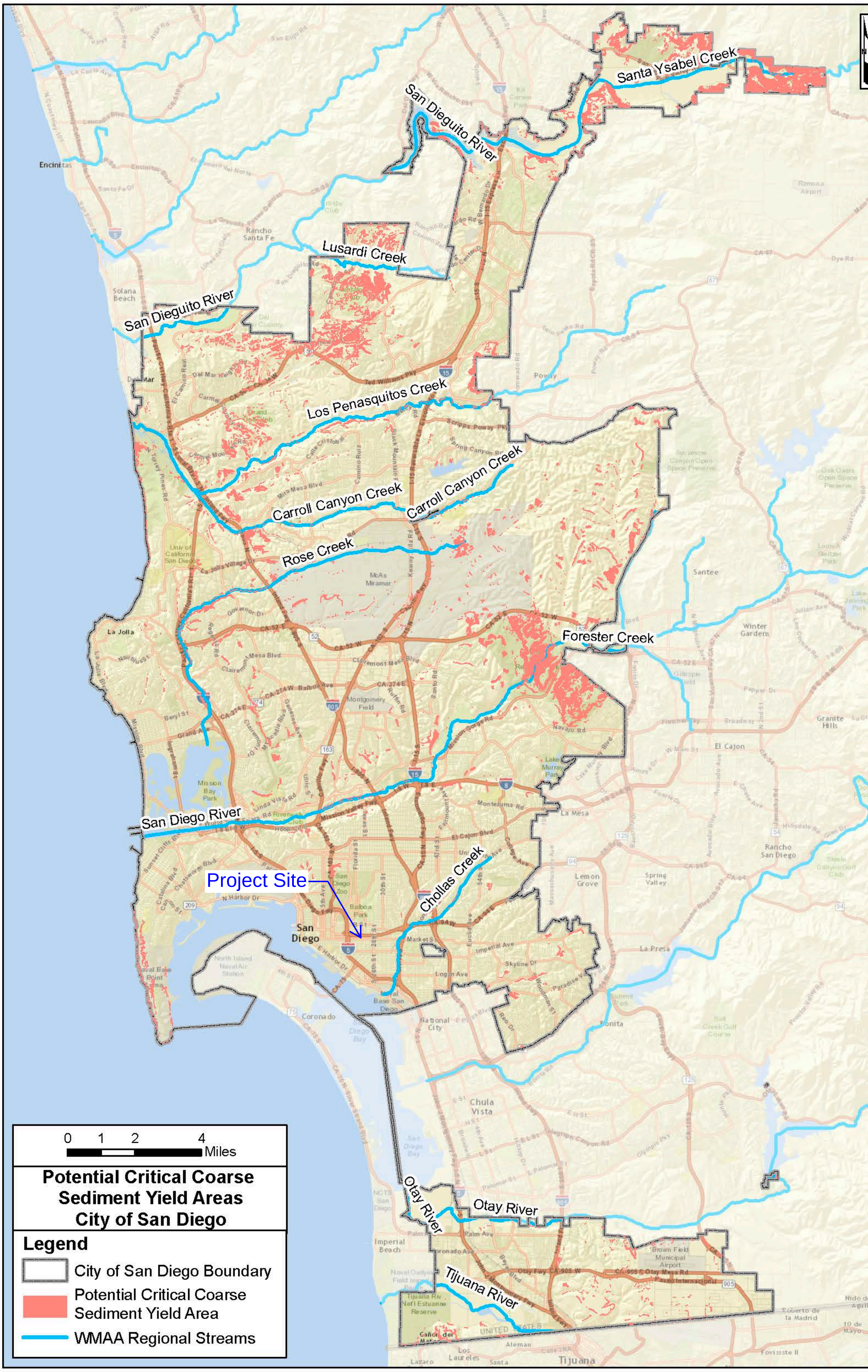
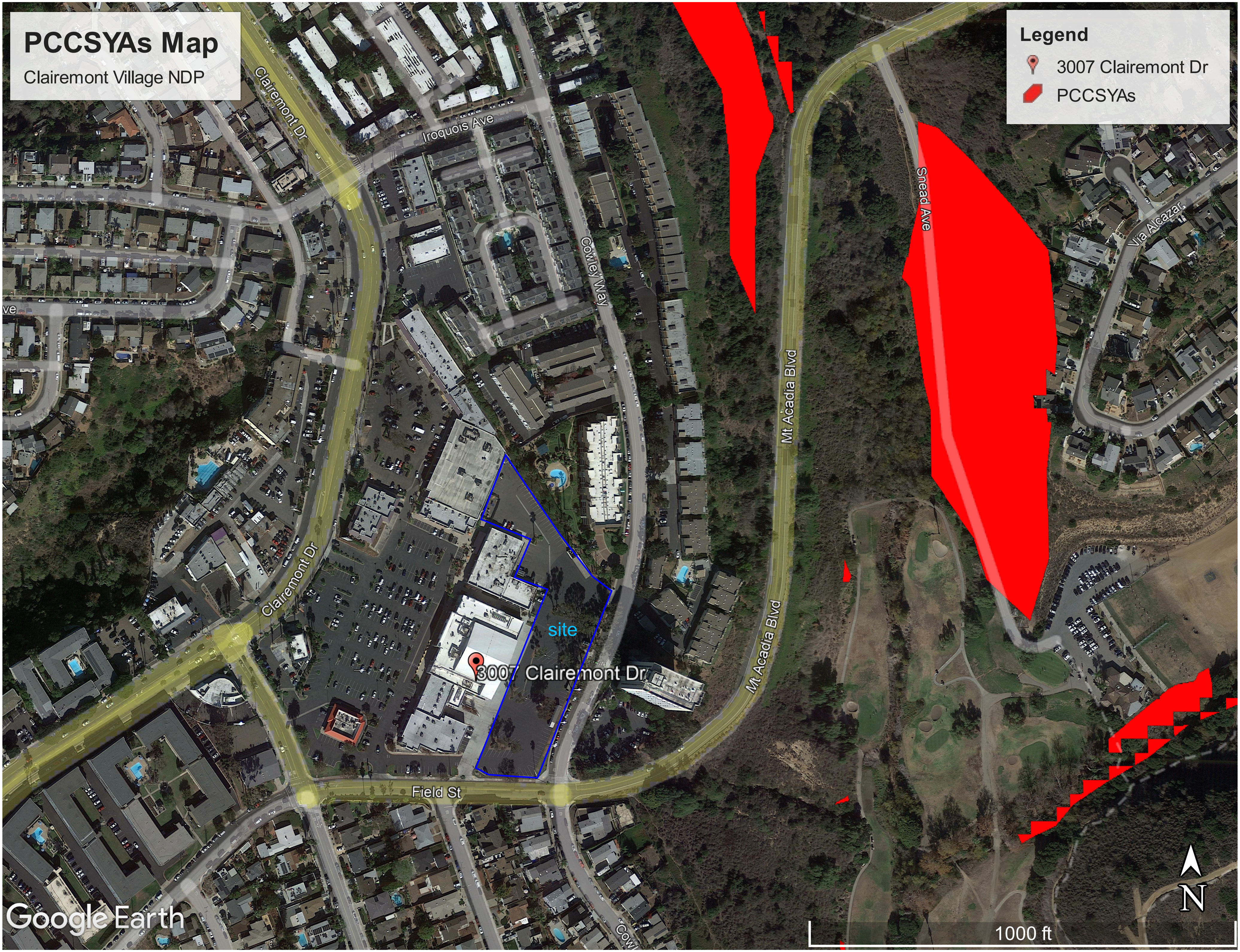


Figure H.9-1 : Potential Critical Coarse Sediment Yield Areas


PCCSYAs Map
Clairemont Village NDP
Legend
3007 Clairemont Dr
PCCSYAs
Iroquois Ave
Clairemont Dr
Cowley Way
Snead Ave
Via Alcazar
Mt Acadia Blvd
site
3007 Clairemont Dr
Field St
N
1000 ft
Google Earth

Attachment 2c:

Geomorphic Assessment of Receiving Channels

Not Applicable

Attachment 2d:

Flow Control Facility Design

TECHNICAL MEMORANDUM
HYDROMODIFICATION MANAGEMENT
CLAIREMONT VILLAGE
3007 Clairemont Drive, San Diego CA

PREPARE BY:

NOVA Engineering

Civil Engineering/Surveying/Planning/Stormwater
4373 Viewridge Avenue, Suite A
San Diego, CA 92123

1.0 INTRODUCTION

This memorandum summarizes the approach used to model the proposed commercial development project site in the City of Oceanside, CA using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed LID bio-filtration facility have sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

There are 3 POCs for the Project Area (pl to pl) as shown on the HMP exhibits. For purposes of this analysis, POC 1 which is associated with the "project footprint" watershed will be analyzed for Hydromodification Management.

2.0 SWMM MODEL DEVELOPMENT

The Clairemont Village project proposes the construction of a new 224 multi-unit apartment community. It also proposes to add parking to the already developed site. There is currently a parking lot that will be replaced with the proposed development.
Two (2) SWMM models were prepared for this study: the first for the pre-development and the second for the post-developed conditions. The project footprint drains to a single Point of Compliance (POC), an onsite grated inlet located southerly corner of the existing AC paved parking lot. behind the ROW. The projects fall under the 50% rule therefore only the new impervious areas along with existing flows that comingle will be treated by the proposed structures.

The SWMM model was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and because it is a non-proprietary model approved by the HMP document. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facility is sufficient to meet the current HMP requirements
The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Oceanside Rain Gage from the Project Clean Water website was used for this study, since it is representative of the project site precipitation due to elevation and proximity to the project site.

Evaporation for the site was modeled using average monthly values from Table G.1-1 of City of San Diego BMP Manual. The site was modeled with Type B hydrologic soil as this is the soil most representative of the site determined from the NRCS Soil Survey. Soils have been assumed to be compacted in the existing condition to represent the current developed graded condition of the site, while fully compacted in the post developed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

3.0 HMP MODELING

This analysis will cover DMA-1 since it represents the area of redevelopment and newly created and replaced impervious areas, DMA-1c represents the area of existing areas to remain unchanged but commingled with new impervious areas and will be modeled as 100% impervious in the pre and post development conditions. DMA-U includes all other areas of existing development that bypass the HMP underground detention facility and are excluded from treatment due to the 50% rule.
DMA X drains to POC -2 and DMA Y drains to POC-3, are both excluded from HMP analysis as they remain unchanged in the pre and post development conditions.

The project (project footprint) is a redevelopment project where redevelopment results in the creation or replacement of impervious surface in an amount of less than fifty percent of the surface area of the previously existing development, therefore the structural BMP performance requirements of MS4 Permit Provision E.3.c and WPO Section 67.811(b)(4) and (5) apply only to the creation or replacement of impervious surface, and not the entire development footprint.

PRE-DEVELOPED CONDITIONS

In current existing conditions, runoff from DMA 1 and DMA-U discharge via overland flow and underground pipe flow to POC-1.

DMA-1 impervious percentage has been set to 0% to represent “pre-project conditions”. DMA-U flows bypass the BMP but drain to POC-1, this DMA remains unchanged in the pre and post development conditions.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	0% (pre-project)
DMA-1C	0.466	100%
DMA-U	3.265	90.0%

DEVELOPED CONDITIONS

Runoff from the re-development areas along with some existing improvements (DMA-1) drained to one (1) onsite receiving HMP underground detention facility (UG-1). Once flows are routed via the proposed detention basin flows are then discharge into an onsite underground storm drain system that commingles with DMA-U flows that drain to POC-1. All onsite flows then discharge into the street's public underground system. The project will incorporate LID principles that will address water quality and HMP requirements accordingly.

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%

One underground detention system is located within the project site and is responsible for handling hydromodification requirements for the project. In developed conditions, the underground detention basin will comprise of footprint of ____square feet and a depth of 3 feet. The vault will feature an open bottom and an underlying 6-inch layer of gravel to provide additional storage for retention volume.
A riser spillway structure with an outlet slot (see dimensions in Table 4) will be located at the downstream end of the system to control the flows. Flows will discharge from the underground basin via a riser outlet structure within the detention system and then discharge directly to onsite private underground pipe system.

The bio-filtration facilities were modeled using the bioretention LID module within SWMM. The bioretention module can model the underground gravel storage layer, underdrain with an orifice plate, amended soil layer, and a surface storage pond up to the elevation of the invert of the spillway.
Detailed outlet structure location and elevations will be shown on the construction/building plans based on the recommendations of this study.

Water Pollution Control

It is assumed all storm water quality requirements for the project will be met by the BMPs detailed in the SWQMP and other BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo. For further information in regard to storm water quality requirements for the project (including sizing and drawdown) please refer to the site specific Storm Water Quality Management Plan (SWQMP).

4.0 BMP MODELING FOR HMP PURPOSES

Modeling of dual-purpose Water Pollution Control/Hydromodification BMPs, POC-1

One underground detention system will be used for hydromodification conformance for the project site. Tables 3 & 4 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED DUAL-PURPOSE BMP

BMP	Tributary Area (Ac)(7)	DIMENSIONS		
		BMP Area(1) (ft^2)	Gravel Depth(2) (ft)	Total Volume (ft^3)
UG-1	2.160	4300	3.2	13,760

Notes: (1): The depth includes the 6-inches (0.5') of gravel beneath the vault surface which has been reduced to represent the volume of voids available (0.4 X 0.5' = 0.2')

TABLE 4 – SUMMARY OF RISER DETAILS

Basin	Lower Orifice		Middle Slot		Upper Weir	
	Diam. (in)	Elev. (ft)	B x h (in)	Elev(1) (ft)	Length(2) (ft)	Elev.(1) (ft)
UG-1	3 x 0.4	0.0	24 x 6	2.20	12	2.70

Notes: (1): Invert of the underground system elevation assumed to be 0.00 ft elevation.

(2): Overflow length is the internal perimeter of the riser structure.

Drawdown Calculations

To ensure compliance with the 96-hour drawdown requirements per Section 6.4.6 of the Final HMP dated March 2011, drawdown calculations are provided in Attachment 4 of this report. Per the drawdown calculations, the drying time of BMP- UG-1 is approximately 24 hours, satisfying drawdown time requirements.

5.0 FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model includes a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at each POC is illustrated in Figure 1 in both normal and logarithmic scale. Attachment 5 provides a detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1, the FDC for the proposed condition with the HMP BMPs is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for POC-1. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

6.0 SUMMARY

This study has demonstrated that the proposed HMP BMP provided for the CLAIREMONT VILLAGE site is sufficient to meet the current HMP criteria for the Point of Compliance (POC), if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifices and outlet structures are incorporated as specified within the proposed project site.

7.0 ASSUMPTIONS

1. Type B Soil is representative of the existing condition site.

8.0 ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Draw Down Calculations
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Soil Survey
9. Summary files from the SWMM Model

9. REFERENCES

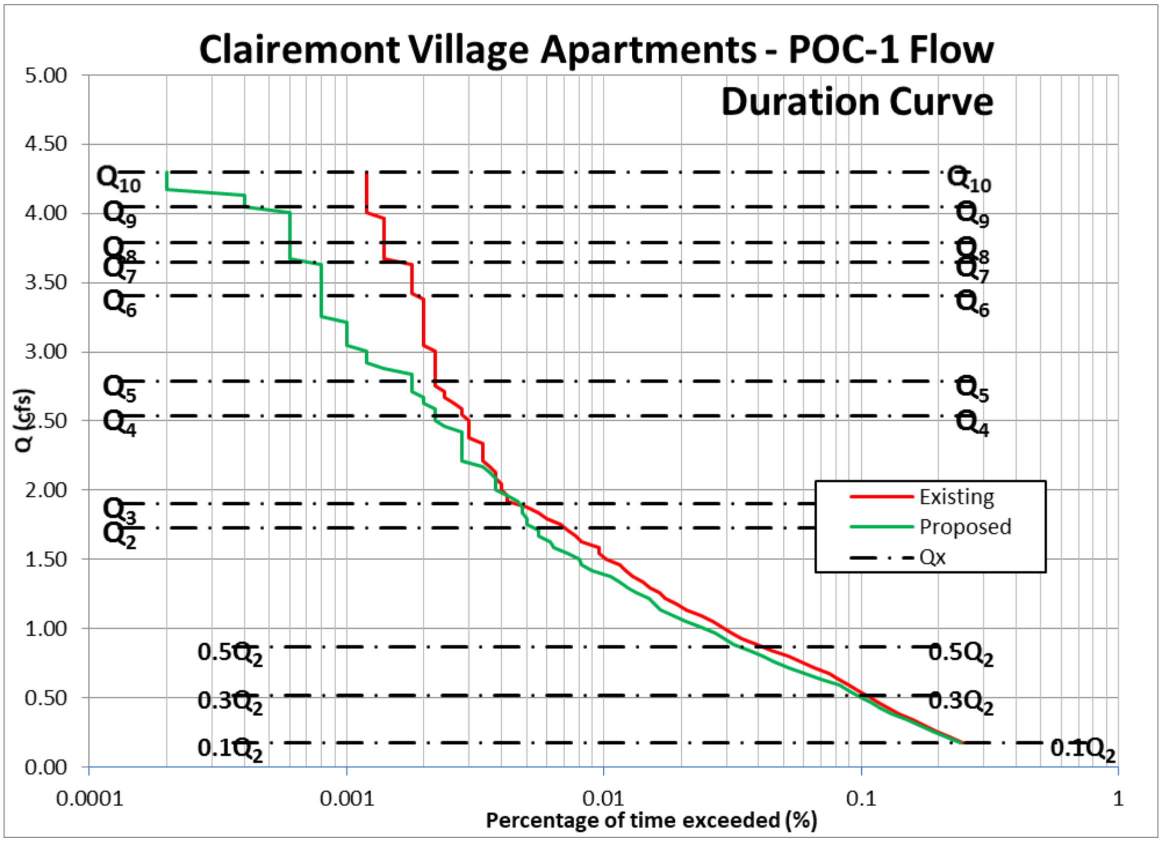
[1] – *"City of San Diego BMP Design Manual Appendix G- Guidance for Continuous Simulation and Hydromodification management Sizing Factors*.

[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego",* March 2011, Brown and Caldwell.

[3] - Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Handbook of Hydrology*", David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – THE CITY OF SAN DIEGO Stormwater Standards Updated Date: May 2021



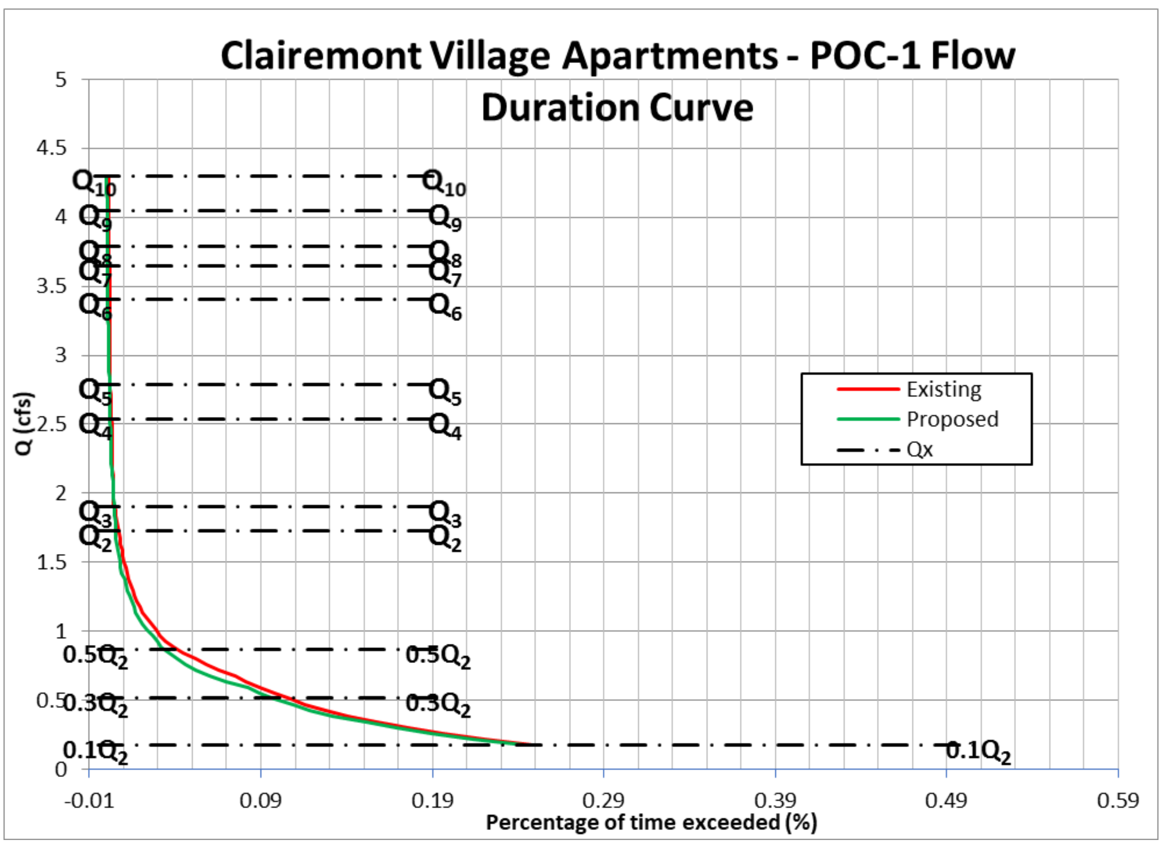


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal “x” scale)

Attachment 1

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
10	4.297	2.910	1.387
9	4.052	2.865	1.187
8	3.789	2.844	0.945
7	3.648	2.750	0.898
6	3.405	2.615	0.790
5	2.784	2.451	0.333
4	2.540	2.051	0.489
3	1.900	1.645	0.255
2	1.730	1.510	0.220

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

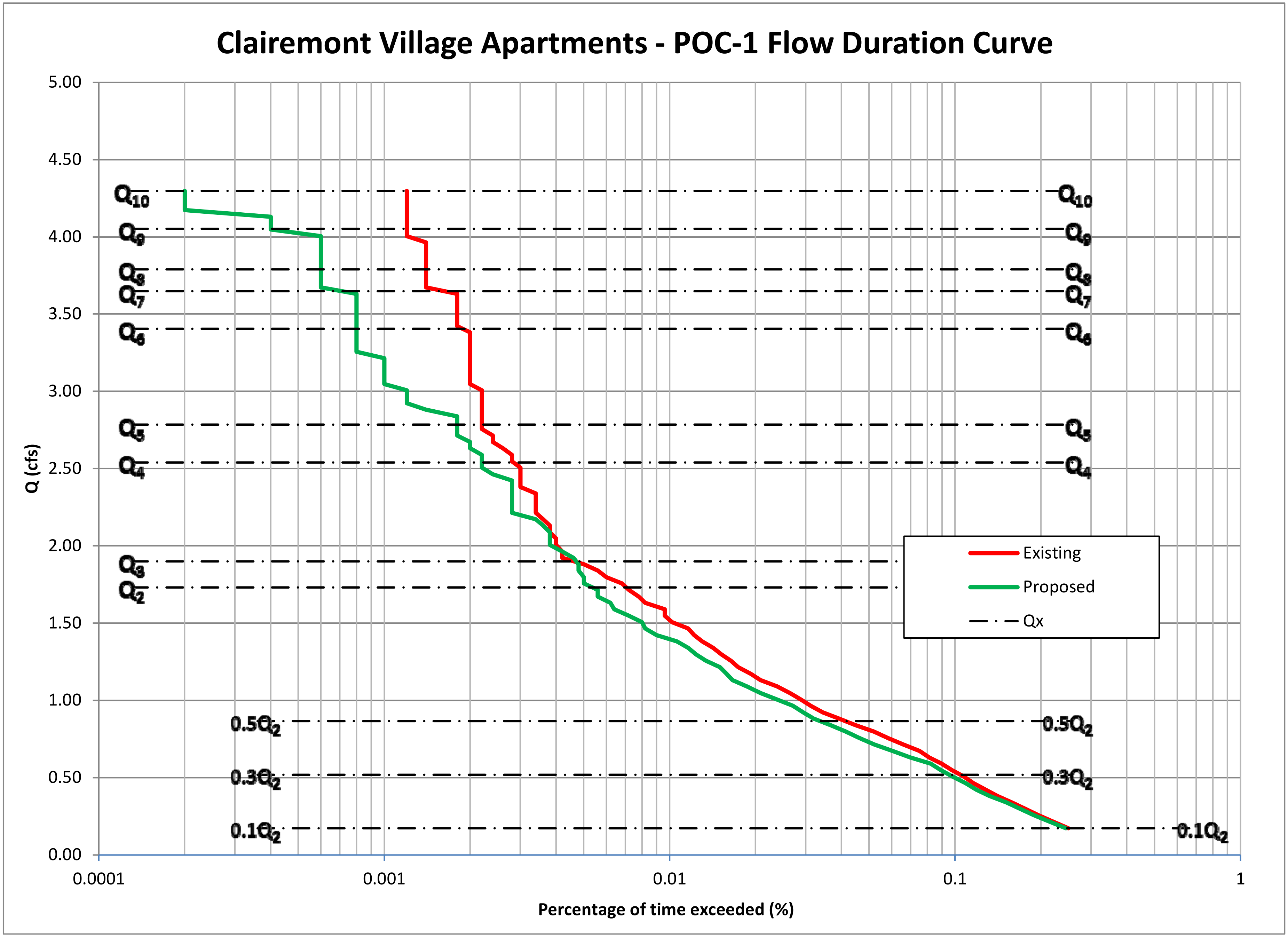
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 - Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

Consequently, the design passes the hydromodification test.

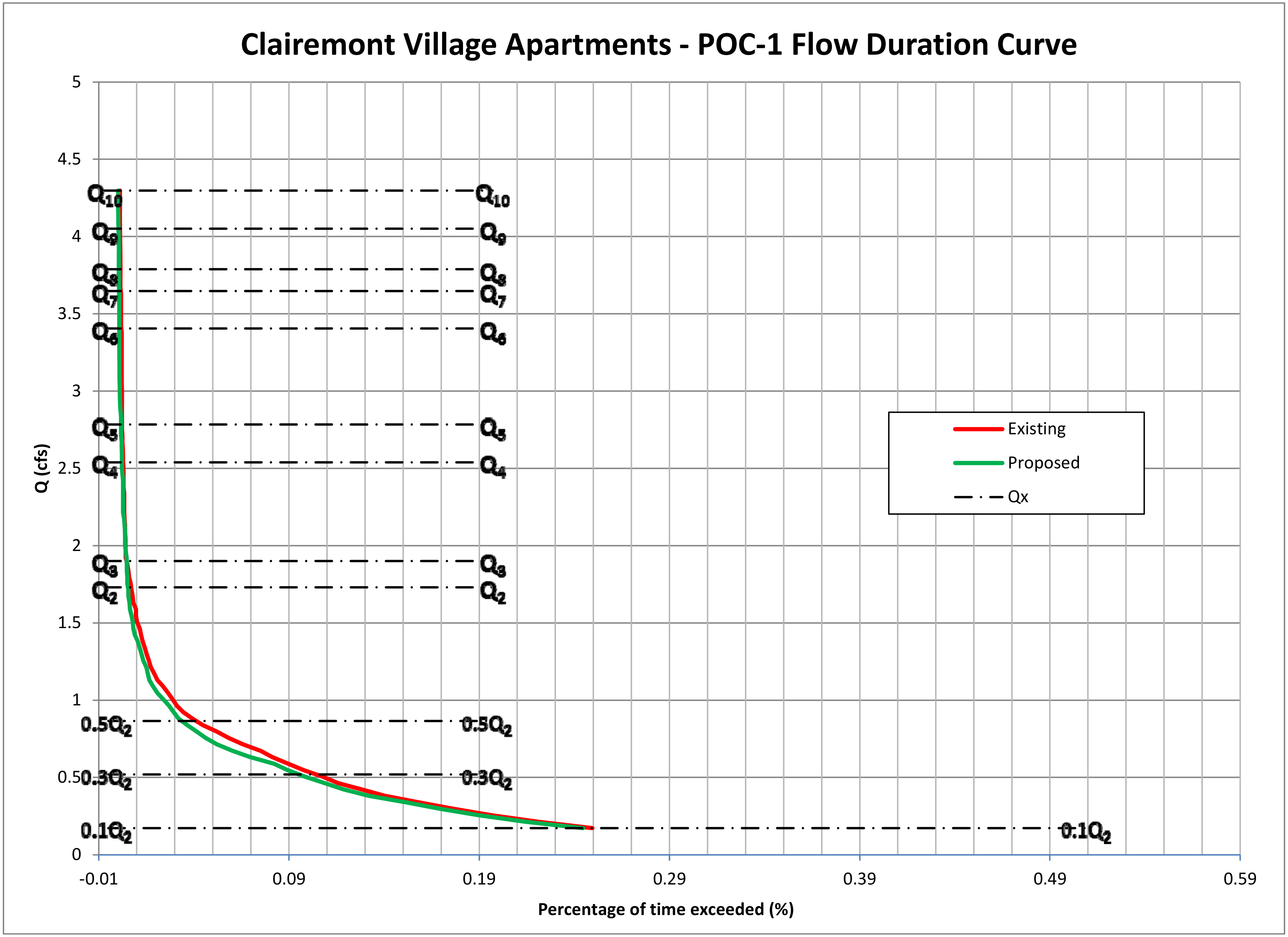
It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the City of San Digo HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by Nova, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x - Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i=2 to 10. The Q_i values are also added into the flow-duration plot.



Clairemont Village Apartments - POC-1 Flow Duration Curve
Q (cfs)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.0001
0.001
0.01
0.1
1
Percentage of time exceeded (%)
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx


Clairemont Village Apartments - POC-1 Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.01
0.09
0.19
0.29
0.39
0.49
0.59
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$
Existing
Proposed
Qx

Flow Duration Curve Data for Clairemont Village Apartments - POC-1 , City of San Diego CA

Q2 =	1.73	cfs	Fraction	10 %
Q10 =	4.30	cfs		
Step =	0.0417	cfs		
Count =	499679	hours		
	57.00	years		

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.173	1247	2.50E-01	1222	2.45E-01	98%	Pass
2	0.215	1102	2.21E-01	1070	2.14E-01	97%	Pass
3	0.256	981	1.96E-01	948	1.90E-01	97%	Pass
4	0.298	881	1.76E-01	846	1.69E-01	96%	Pass
5	0.340	790	1.58E-01	757	1.51E-01	96%	Pass
6	0.381	702	1.40E-01	660	1.32E-01	94%	Pass
7	0.423	640	1.28E-01	593	1.19E-01	93%	Pass
8	0.465	579	1.16E-01	544	1.09E-01	94%	Pass
9	0.506	537	1.07E-01	490	9.81E-02	91%	Pass
10	0.548	489	9.79E-02	447	8.95E-02	91%	Pass
11	0.590	448	8.97E-02	411	8.23E-02	92%	Pass
12	0.631	406	8.13E-02	348	6.96E-02	86%	Pass
13	0.673	375	7.50E-02	302	6.04E-02	81%	Pass
14	0.715	329	6.58E-02	261	5.22E-02	79%	Pass
15	0.756	291	5.82E-02	231	4.62E-02	79%	Pass
16	0.798	260	5.20E-02	207	4.14E-02	80%	Pass
17	0.840	224	4.48E-02	183	3.66E-02	82%	Pass
18	0.881	196	3.92E-02	160	3.20E-02	82%	Pass
19	0.923	172	3.44E-02	147	2.94E-02	85%	Pass
20	0.965	156	3.12E-02	135	2.70E-02	87%	Pass
21	1.006	144	2.88E-02	119	2.38E-02	83%	Pass
22	1.048	132	2.64E-02	104	2.08E-02	79%	Pass
23	1.090	119	2.38E-02	93	1.86E-02	78%	Pass
24	1.131	104	2.08E-02	83	1.66E-02	80%	Pass
25	1.173	96	1.92E-02	79	1.58E-02	82%	Pass
26	1.215	87	1.74E-02	75	1.50E-02	86%	Pass
27	1.256	82	1.64E-02	67	1.34E-02	82%	Pass
28	1.298	76	1.52E-02	62	1.24E-02	82%	Pass
29	1.339	71	1.42E-02	58	1.16E-02	82%	Pass
30	1.381	65	1.30E-02	53	1.06E-02	82%	Pass
31	1.423	61	1.22E-02	45	9.01E-03	74%	Pass
32	1.464	58	1.16E-02	41	8.21E-03	71%	Pass
33	1.506	51	1.02E-02	40	8.01E-03	78%	Pass
34	1.548	48	9.61E-03	36	7.20E-03	75%	Pass
35	1.589	48	9.61E-03	32	6.40E-03	67%	Pass
36	1.631	41	8.21E-03	31	6.20E-03	76%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	1.673	39	7.81E-03	28	5.60E-03	72%	Pass
38	1.714	36	7.20E-03	28	5.60E-03	78%	Pass
39	1.756	34	6.80E-03	25	5.00E-03	74%	Pass
40	1.798	30	6.00E-03	25	5.00E-03	83%	Pass
41	1.839	28	5.60E-03	24	4.80E-03	86%	Pass
42	1.881	25	5.00E-03	24	4.80E-03	96%	Pass
43	1.923	21	4.20E-03	23	4.60E-03	110%	Pass
44	1.964	21	4.20E-03	21	4.20E-03	100%	Pass
45	2.006	20	4.00E-03	19	3.80E-03	95%	Pass
46	2.048	20	4.00E-03	19	3.80E-03	95%	Pass
47	2.089	19	3.80E-03	19	3.80E-03	100%	Pass
48	2.131	19	3.80E-03	18	3.60E-03	95%	Pass
49	2.173	18	3.60E-03	17	3.40E-03	94%	Pass
50	2.214	17	3.40E-03	14	2.80E-03	82%	Pass
51	2.256	17	3.40E-03	14	2.80E-03	82%	Pass
52	2.298	17	3.40E-03	14	2.80E-03	82%	Pass
53	2.339	17	3.40E-03	14	2.80E-03	82%	Pass
54	2.381	15	3.00E-03	14	2.80E-03	93%	Pass
55	2.423	15	3.00E-03	14	2.80E-03	93%	Pass
56	2.464	15	3.00E-03	12	2.40E-03	80%	Pass
57	2.506	15	3.00E-03	11	2.20E-03	73%	Pass
58	2.548	14	2.80E-03	11	2.20E-03	79%	Pass
59	2.589	14	2.80E-03	11	2.20E-03	79%	Pass
60	2.631	13	2.60E-03	10	2.00E-03	77%	Pass
61	2.673	12	2.40E-03	10	2.00E-03	83%	Pass
62	2.714	12	2.40E-03	9	1.80E-03	75%	Pass
63	2.756	11	2.20E-03	9	1.80E-03	82%	Pass
64	2.798	11	2.20E-03	9	1.80E-03	82%	Pass
65	2.839	11	2.20E-03	9	1.80E-03	82%	Pass
66	2.881	11	2.20E-03	7	1.40E-03	64%	Pass
67	2.923	11	2.20E-03	6	1.20E-03	55%	Pass
68	2.964	11	2.20E-03	6	1.20E-03	55%	Pass
69	3.006	11	2.20E-03	6	1.20E-03	55%	Pass
70	3.048	10	2.00E-03	5	1.00E-03	50%	Pass
71	3.089	10	2.00E-03	5	1.00E-03	50%	Pass
72	3.131	10	2.00E-03	5	1.00E-03	50%	Pass
73	3.173	10	2.00E-03	5	1.00E-03	50%	Pass
74	3.214	10	2.00E-03	5	1.00E-03	50%	Pass
75	3.256	10	2.00E-03	4	8.01E-04	40%	Pass
76	3.298	10	2.00E-03	4	8.01E-04	40%	Pass
77	3.339	10	2.00E-03	4	8.01E-04	40%	Pass
78	3.381	10	2.00E-03	4	8.01E-04	40%	Pass
79	3.423	9	1.80E-03	4	8.01E-04	44%	Pass
80	3.464	9	1.80E-03	4	8.01E-04	44%	Pass
81	3.506	9	1.80E-03	4	8.01E-04	44%	Pass

Interval	Existing Condition			Detention Optimized			Pass or
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
82	3.547	9	1.80E-03	4	8.01E-04	44%	Pass
83	3.589	9	1.80E-03	4	8.01E-04	44%	Pass
84	3.631	9	1.80E-03	4	8.01E-04	44%	Pass
85	3.672	7	1.40E-03	3	6.00E-04	43%	Pass
86	3.714	7	1.40E-03	3	6.00E-04	43%	Pass
87	3.756	7	1.40E-03	3	6.00E-04	43%	Pass
88	3.797	7	1.40E-03	3	6.00E-04	43%	Pass
89	3.839	7	1.40E-03	3	6.00E-04	43%	Pass
90	3.881	7	1.40E-03	3	6.00E-04	43%	Pass
91	3.922	7	1.40E-03	3	6.00E-04	43%	Pass
92	3.964	7	1.40E-03	3	6.00E-04	43%	Pass
93	4.006	6	1.20E-03	3	6.00E-04	50%	Pass
94	4.047	6	1.20E-03	2	4.00E-04	33%	Pass
95	4.089	6	1.20E-03	2	4.00E-04	33%	Pass
96	4.131	6	1.20E-03	2	4.00E-04	33%	Pass
97	4.172	6	1.20E-03	1	2.00E-04	17%	Pass
98	4.214	6	1.20E-03	1	2.00E-04	17%	Pass
99	4.256	6	1.20E-03	1	2.00E-04	17%	Pass
100	4.297	6	1.20E-03	1	2.00E-04	17%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	4.297	2.910	1.387
9	4.052	2.865	1.187
8	3.789	2.844	0.945
7	3.648	2.750	0.898
6	3.405	2.615	0.790
5	2.784	2.451	0.333
4	2.540	2.051	0.489
3	1.900	1.645	0.255
2	1.730	1.510	0.220

ATTACHMENT 3

List of the “n” Largest Peaks: Pre & Post-Developed Conditions

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

P: Probability of a flow to be equaled or exceeded any given year (dimensionless).

Cunnane Equation:

$$P = \frac{i-0.4}{n+0.2}$$

Weibull Equation:

$$P = \frac{i}{n+1}$$

i: Position of the peak whose probability is desired (sorted from large to small)

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of Q2 and Q10 (Pre-Development)
Clairemont Village Apartments - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**4.30**	**4.39**
9	**4.05**	**4.17**
8	**3.79**	**3.88**
7	**3.65**	**3.65**
6	**3.41**	**3.47**
5	**2.78**	**2.85**
4	**2.54**	**2.55**
3	**1.90**	**1.90**
2	**1.73**	**1.73**

Note:
Cunnane is the preferred method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years) Weibull	Period of Return (Years) Cunnane
1.31	1/4/1995	57	1.02	1.01
1.31	2/23/2005	56	1.04	1.03
1.32	2/8/1993	55	1.05	1.05
1.34	1/21/1964	54	1.07	1.07
1.35	2/17/1971	53	1.09	1.09
1.36	2/8/1998	52	1.12	1.11
1.38	12/31/1976	51	1.14	1.13
1.41	11/16/1965	50	1.16	1.15
1.41	12/28/1989	49	1.18	1.18
1.42	5/8/1977	48	1.21	1.20
1.43	10/10/1986	47	1.23	1.23
1.45	2/12/2003	46	1.26	1.25
1.48	12/18/1967	45	1.29	1.28
1.48	1/31/1993	44	1.32	1.31
1.49	2/8/1976	43	1.35	1.34
1.49	1/18/1993	42	1.38	1.38
1.5	1/14/1969	41	1.41	1.41
1.52	4/6/1986	40	1.45	1.44
1.52	1/15/1993	39	1.49	1.48
1.61	12/5/1987	38	1.53	1.52
1.62	11/10/1949	37	1.57	1.56
1.62	2/4/1958	36	1.61	1.61
1.63	3/11/1995	35	1.66	1.65
1.64	11/14/1950	34	1.71	1.70
1.66	2/25/1981	33	1.76	1.75
1.68	12/23/1995	32	1.81	1.81
1.68	2/17/1998	31	1.87	1.87
1.71	11/17/1986	30	1.93	1.93
1.73	3/1/1983	29	2.00	2.00
1.75	12/28/2004	28	2.07	2.07
1.76	3/17/1982	27	2.15	2.15
1.79	11/5/1987	26	2.23	2.23
1.79	2/14/1995	25	2.32	2.33
1.8	3/6/1975	24	2.42	2.42
1.85	1/18/1952	23	2.52	2.53
1.86	3/24/1983	22	2.64	2.65
1.87	4/21/1988	21	2.76	2.78
1.9	1/12/1960	20	2.90	2.92
1.9	2/24/1998	19	3.05	3.08
1.98	1/6/1979	18	3.22	3.25
2.06	2/21/2005	17	3.41	3.45
2.17	3/1/1981	16	3.63	3.67
2.52	3/16/1986	15	3.87	3.92
2.59	1/10/1955	14	4.14	4.21
2.65	1/10/1978	13	4.46	4.54
2.74	12/4/1974	12	4.83	4.93
3.04	3/8/1968	11	5.27	5.40
3.39	1/31/1979	10	5.80	5.96
3.64	2/28/1970	9	6.44	6.65
3.66	10/27/2004	8	7.25	7.53
3.97	1/25/1995	7	8.29	8.67
4.35	11/16/1972	6	9.67	10.21
4.56	11/21/1967	5	11.60	12.43
5.02	3/7/1952	4	14.50	15.89
5.2	12/29/2004	3	19.33	22.00
5.28	2/20/1980	2	29.00	35.75
8.3	12/10/1965	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)
Clairemont Village Apartments - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**2.91**	**2.98**
9	**2.87**	**2.89**
8	**2.84**	**2.85**
7	**2.75**	**2.79**
6	**2.61**	**2.63**
5	**2.45**	**2.45**
4	**2.05**	**2.09**
3	**1.65**	**1.65**
2	**1.51**	**1.51**

Note:
Cunnane is the preferred method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
1.2	12/31/1976	57	1.02	1.01
1.2	1/18/1993	56	1.04	1.03
1.22	1/29/1980	55	1.05	1.05
1.22	12/28/1989	54	1.07	1.07
1.23	3/1/1991	53	1.09	1.09
1.24	5/8/1977	52	1.12	1.11
1.25	2/8/1976	51	1.14	1.13
1.25	10/10/1986	50	1.16	1.15
1.26	2/12/2003	49	1.18	1.18
1.27	2/17/1998	48	1.21	1.20
1.28	1/31/1993	47	1.23	1.23
1.29	12/18/1967	46	1.26	1.25
1.31	1/14/1969	45	1.29	1.28
1.32	4/6/1986	44	1.32	1.31
1.33	3/1/1983	43	1.35	1.34
1.35	3/17/1982	42	1.38	1.38
1.37	1/18/1952	41	1.41	1.41
1.38	1/14/1978	40	1.45	1.44
1.39	12/5/1987	39	1.49	1.48
1.4	3/24/1983	38	1.53	1.52
1.41	11/10/1949	37	1.57	1.56
1.41	2/4/1958	36	1.61	1.61
1.41	4/21/1988	35	1.66	1.65
1.41	3/11/1995	34	1.71	1.70
1.43	11/14/1950	33	1.76	1.75
1.44	2/25/1981	32	1.81	1.81
1.46	12/23/1995	31	1.87	1.87
1.49	11/17/1986	30	1.93	1.93
1.51	3/1/1981	29	2.00	2.00
1.52	12/28/2004	28	2.07	2.07
1.53	2/14/2003	27	2.15	2.15
1.54	3/2/1983	26	2.23	2.23
1.56	3/6/1975	25	2.32	2.33
1.56	11/5/1987	24	2.42	2.42
1.56	2/14/1995	23	2.52	2.53
1.58	1/6/1979	22	2.64	2.65
1.6	11/25/1985	21	2.76	2.78
1.64	2/24/1998	20	2.90	2.92
1.65	1/12/1960	19	3.05	3.08
1.73	1/15/1993	18	3.22	3.25
1.75	3/16/1986	17	3.41	3.45
1.83	1/10/1978	16	3.63	3.67
2	1/4/1995	15	3.87	3.92
2.18	12/4/1974	14	4.14	4.21
2.21	1/10/1955	13	4.46	4.54
2.45	2/21/2005	12	4.83	4.93
2.46	3/8/1968	11	5.27	5.40
2.61	10/27/2004	10	5.80	5.96
2.69	1/31/1979	9	6.44	6.65
2.84	11/16/1972	8	7.25	7.53
2.85	11/21/1967	7	8.29	8.67
2.92	2/28/1970	6	9.67	10.21
3.24	2/20/1980	5	11.60	12.43
3.64	3/7/1952	4	14.50	15.89
4.02	1/25/1995	3	19.33	22.00
4.17	12/29/2004	2	29.00	35.75
8.77	12/10/1965	1	58.00	95.33

ATTACHMENT 4

AREA VS ELEVATION

The storage provided within the detention basin is located within the basin module in SWMM. Given that the basin is a vault with a constant area footprint (i.e. the area remains constant as the depth increases), no stage-storage calculation is required.

DISCHARGE VS ELEVATION

The orifices have been selected to maximize their size while still restricting flows to conform with the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While Nova acknowledges that these orifices are small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to further reduce the risk of blockage of the orifices, regular maintenance of the riser and orifices must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this memorandum.

The LID low flow orifice discharge relationship is addressed within the LID Module within SWMM – please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

Surface drawdown calculations are provided on the following pages for reference and proof of draining within 24 hours. It is assumed the basin is full to the invert of the first surface outlet structure such that the only discharge mechanism available is the LID orifice. The HMS analysis provided on the following pages indicates the basin is dry within approximately 24 hours.

DISCHARGE EQUATIONS

1) Weir:
$Q_W = C_W \cdot L \cdot H^{3/2}$ (1)

2) Slot:

As an orifice: $Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)}$ (2.a)

As a weir: $Q_s = C_W \cdot B_s \cdot H^{3/2}$ (2.b)

For H > h_s slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

3) Vertical Orifices

As an orifice: $Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)}$ (3.a)

As a weir: Critical depth and geometric family of circular sector must be solved to determined Q as a function of H:

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}\,; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})]\,;$$

$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})]$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

There is a value of H (approximately H = 110% D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type o discharge.

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

C_W, c_g : Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s : Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

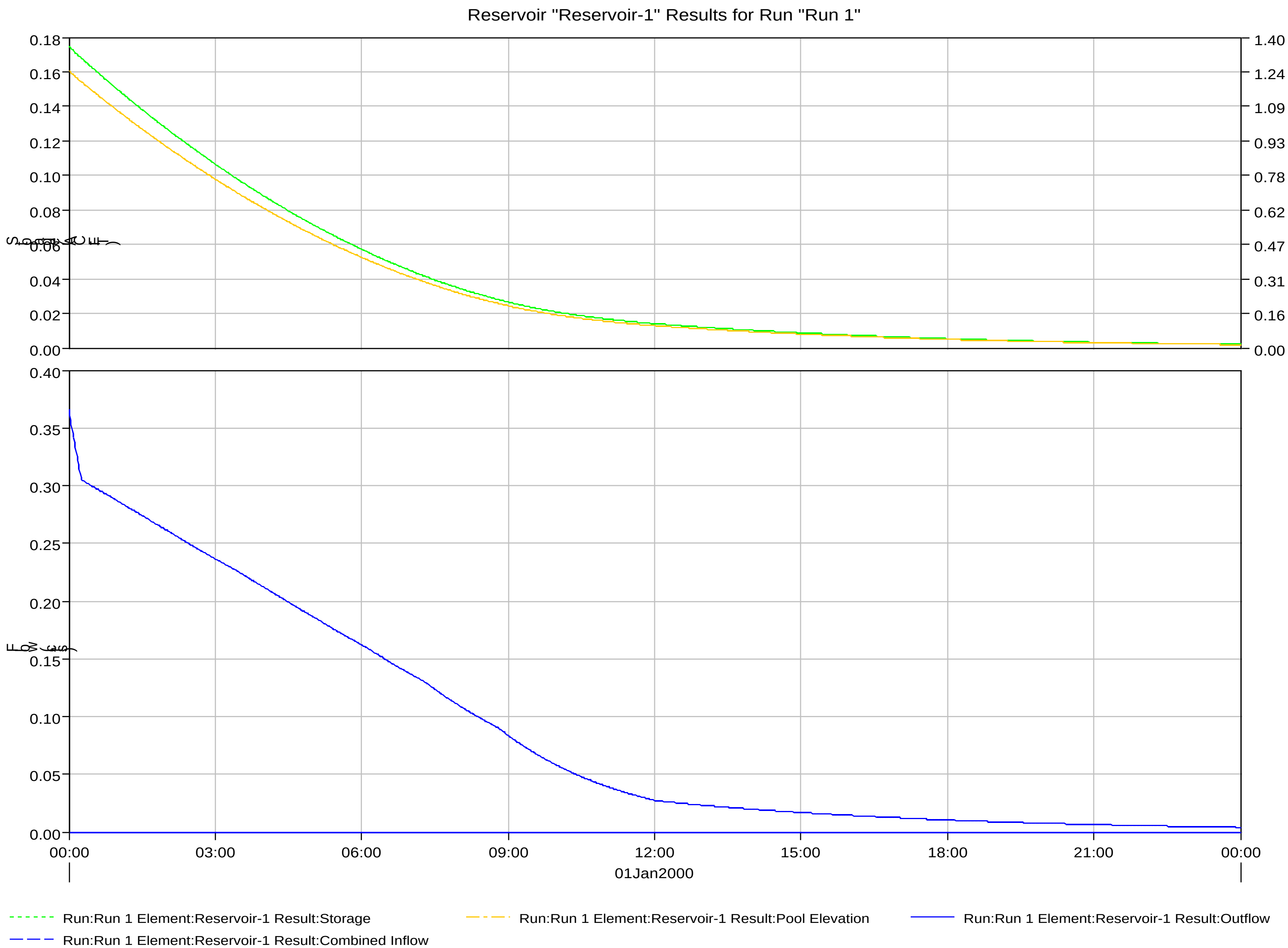
A_{cr}, T_{cr}, y_{cr}, α_{cr}: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Outlet structure for Discharge of Detention Basin

Discharge vs Elevation Table

Low orifice:	0.4	"	Lower slot			Emergency Weir	
Number:	3		Invert:	2.20	ft	Invert:	2.700 ft
Cg-low:	0.62		B	2.00	ft	B:	12 ft
Middle orifice:	1	"	h	0.500	ft		
number of orif:	0		Upper slot				
Cg-middle:	0.62		Invert:	0.000	ft		
invert elev:	0.50	ft	B:	0.00	ft		
			h	0.000	ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	3.000	0.000	0.004	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.004
0.200	6.000	0.000	0.006	0.056	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.006
0.300	9.000	0.000	0.007	0.069	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
0.400	12.000	0.000	0.008	0.081	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.008
0.500	15.000	0.000	0.009	0.091	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.009
0.600	18.000	1.200	0.010	0.099	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
0.700	21.000	2.400	0.011	0.108	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.011
0.800	24.000	3.600	0.012	0.115	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.012
0.900	27.000	4.800	0.012	0.122	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.012
1.000	30.000	6.000	0.013	0.129	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013
1.100	33.000	7.200	0.014	0.136	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.014
1.200	36.000	8.400	0.014	0.142	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.014
1.300	39.000	9.600	0.015	0.148	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
1.400	42.000	10.800	0.015	0.153	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.015
1.500	45.000	12.000	0.016	0.159	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.016
1.600	48.000	13.200	0.016	0.164	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.016
1.700	51.000	14.400	0.017	0.169	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
1.800	54.000	15.600	0.017	0.174	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.017
1.900	57.000	16.800	0.018	0.179	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
2.000	60.000	18.000	0.018	0.183	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018
2.100	63.000	19.200	0.019	0.188	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.019
2.200	66.000	20.400	0.019	0.192	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.019
2.300	69.000	21.600	0.020	0.197	0.020	0.000	0.000	0.000	0.196	0.000	0.000	0.216
2.400	72.000	22.800	0.020	0.201	0.020	0.000	0.000	0.000	0.555	0.000	0.000	0.575
2.500	75.000	24.000	0.021	0.205	0.021	0.000	0.000	0.000	1.019	0.000	0.000	1.039
2.600	78.000	25.200	0.021	0.209	0.021	0.000	0.000	0.000	1.568	0.000	0.000	1.589
2.700	81.000	26.400	0.021	0.213	0.021	0.000	0.000	0.000	2.192	0.000	0.000	2.213
2.800	84.000	27.600	0.022	0.217	0.022	0.000	0.000	0.000	2.881	0.000	1.176	4.080
2.900	87.000	28.800	0.022	0.221	0.022	0.000	0.000	0.000	3.284	0.000	3.327	6.633
3.000	90.000	30.000	0.022	0.225	0.022	0.000	0.000	0.000	3.630	0.000	6.113	9.765
3.100	93.000	31.200	0.023	0.229	0.023	0.000	0.000	0.000	3.947	0.000	9.411	13.380
3.200	96.000	32.400	0.023	0.232	0.023	0.000	0.000	0.000	4.239	0.000	13.152	17.415



Reservoir "Reservoir-1" Results for Run "Run 1"
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1.40
1.24
1.09
0.93
0.78
0.62
0.47
0.31
0.16
0.00
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Jan2000
Run:Run 1 Element:Reservoir-1 Result:Storage
Run:Run 1 Element:Reservoir-1 Result:Pool Elevation
Run:Run 1 Element:Reservoir-1 Result:Outflow
Run:Run 1 Element:Reservoir-1 Result:Combined Inflow

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention Section Sketches

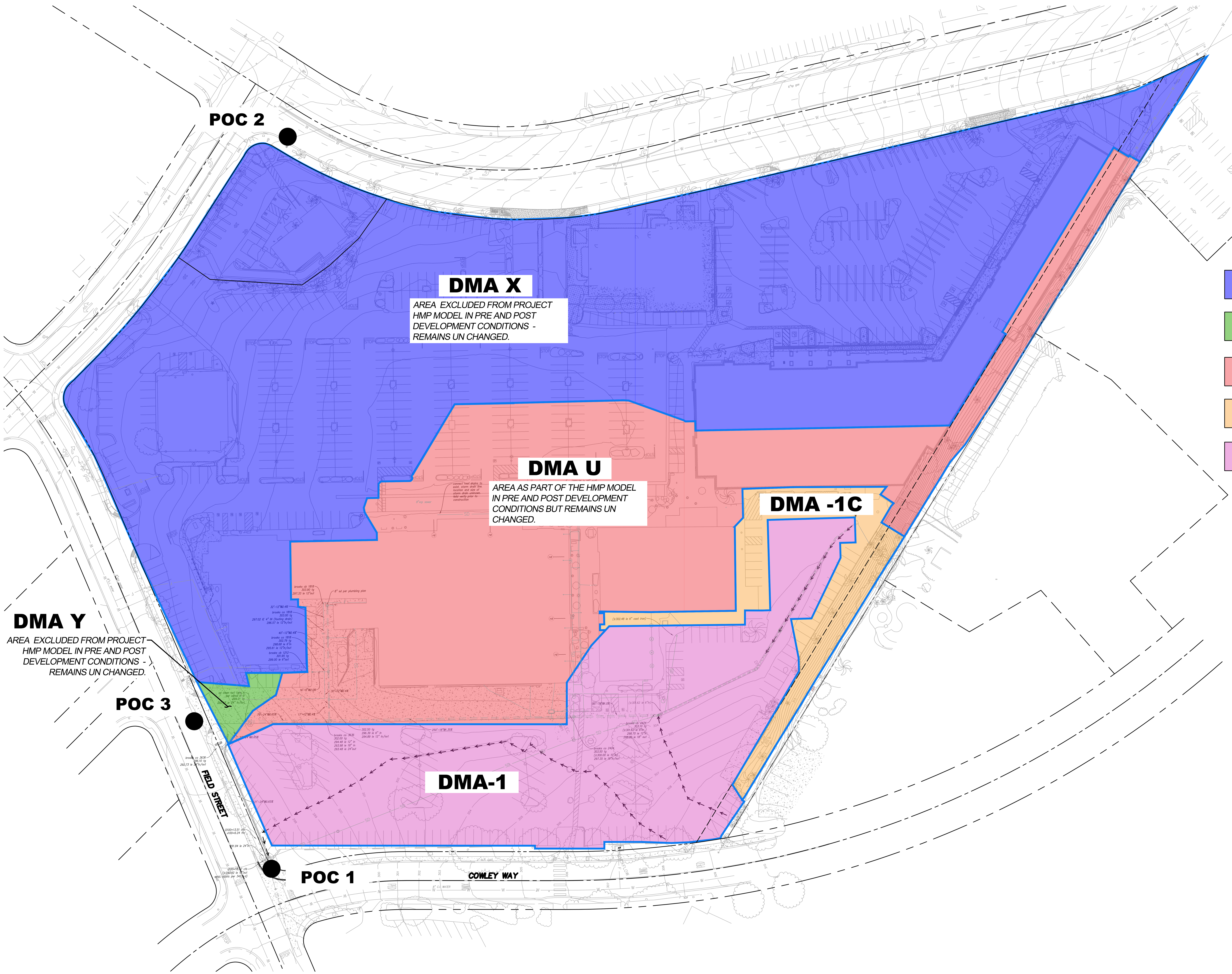


TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	0% (pre-project)
DMA-1C	0.466	100%
DMA-U	3.265	90.0%
DMA-X	6.800	90.0%
DMA-Y	0.069	90.0%

EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 2

EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 3

EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1

EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)

NEW/REPLACED AREAS IN POST DEVELOPMENT CONDITIONS (PERVIOUS & IMPERVIOUS) DRAINS TO POC 1

HMP PRE-DEVELOPMENT

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

PRE DEVELOPMENT

DATE: 04/25/22

DRAWING:

SHEET 1 OF 1

SAVE DATE: 4/25/2022 ~ PLOT DATE: 4/25/2022 ~ FILE NAME: C:\Users\Parra\Dropbox\AP PROJECTS\100.68 Nova Clairemont\HMP\Pre_POC 2022.dwg

NOTES:

1. THE UNDERLYING SOIL TYPE GROUPS "B" FOR THE ENTIRE PROPERTY AND SURROUNDING PARCELS
2. THE APPROXIMATE DEPTH TO GROUND WATER IS EXPECTED TO BE LESS THAN 15 FEET.
3. NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED BASED ON WMAA MAPS(SEE PROJECT SWQMP).
4. THE SITE DOES NOT CONTAIN ANY EXISTING NATURAL HYDROLOGIC FEATURES. (WATERCOURSES, SEEPS, SPRINGS, WETLANDS.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	0% (pre-project)
DMA-1C	0.466	100%
DMA-U	3.265	90.0%

EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1

EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)

NEW/REPLACED AREAS IN POST DEVELOPMENT CONDITIONS (PERVIOUS & IMPERVIOUS) DRAINS TO POC 1

HMP PRE-DEVELOPMENT

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117
PRE DEVELOPMENT

DATE: 04/25/22

DRAWING:
SHEET 1 OF 1

SAVE DATE: 4/25/2022 ~ PLOT DATE: 4/25/2022 ~ FILE NAME: C:\Users\Parra\Dropbox\AP PROJECTS\100.68 Nova Clairemont\HMP\Pre_POC 2022.dwg

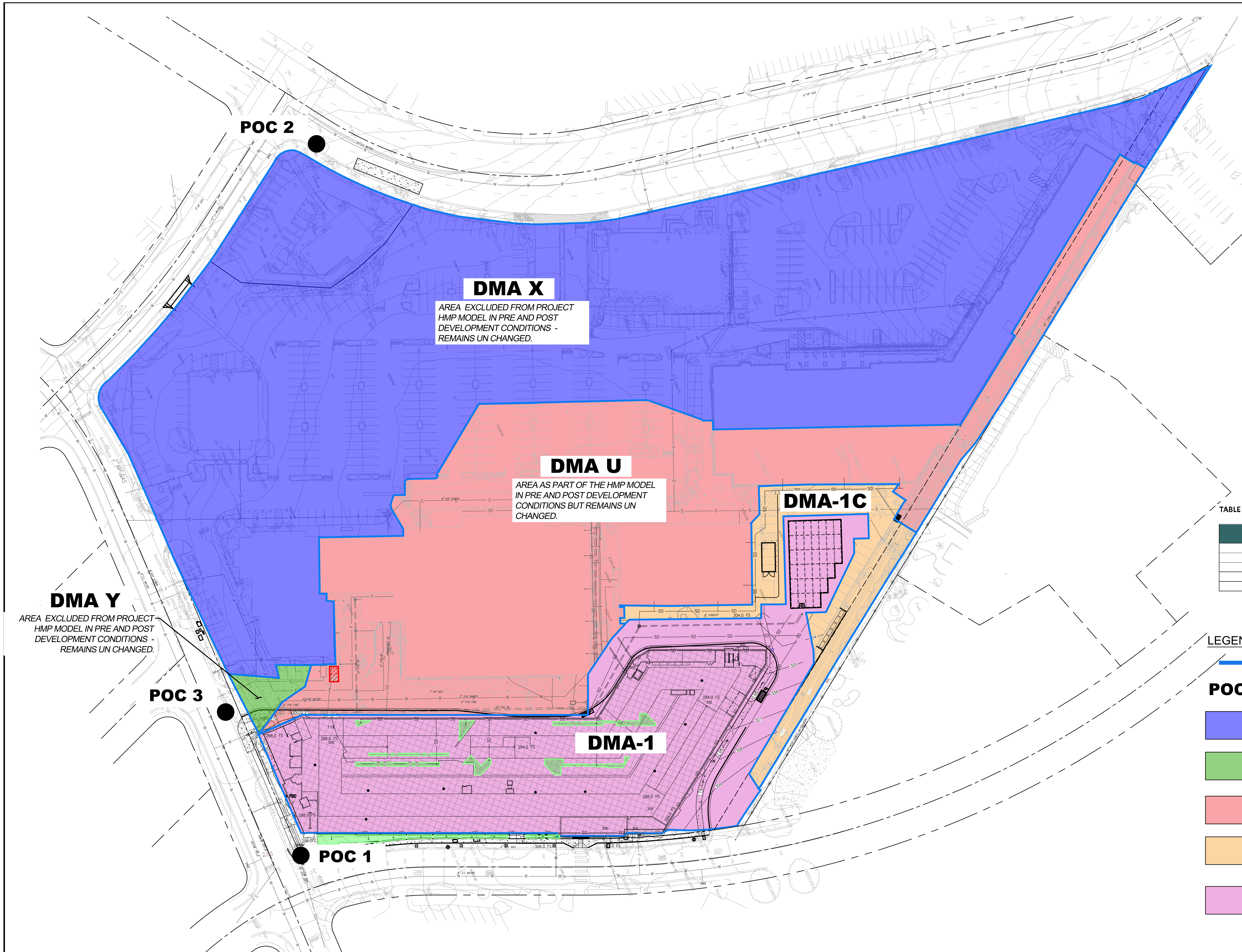


TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%
DMA-X	6.800	90.0%
DMA-Y	0.069	90.0%

LEGEND

DRAINAGE MANAGEMENT AREA (DMA)

POC 1 ● POINT OF COMPLIANCE

EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 2

EX. AREA EXCLUDED FROM HMP, BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 3

EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1

EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)

NEW/REPLACED AREAS IN POST DEVELOPMENT CONDITIONS (PERVIOUS & IMPERVIOUS) DRAINS TO POC 1

HMP POST DEVELOPMENT

CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

DATE: 08/25/22

DRAWING:
SHEET 1 OF 1

LEGEND

- DRAINAGE MANAGEMENT AREA (DMA) — blue line
- FLOW DIRECTION — arrow
- **POC 1** — POINT OF COMPLIANCE
- **UG-1** — UNDERGROUND SYSTEM
- **MWS-#** — MODULAR WETLAND SYSTEM
- PLANTER AREAS (TREATMENT FOR UPPER LEVELS)
- (P) — PROPOSED PIPE

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	2.160	92.0%
DMA-1C	0.466	100%
DMA-U	3.265	90.0%

TABLE 3 – SUMMARY OF DEVELOPED DUAL-PURPOSE BMP

BMP	Tributary Area (Ac)(7)	DIMENSIONS		
		BMP Area(1) (ft^2)	Gravel Depth(2) (ft)	Total Volume (ft^3)
UG-1	2.160	4300	3.2	13,760

TABLE 4 – SUMMARY OF RISER DETAILS

Basin	Lower Orifice		Middle Slot		Upper Weir	
	Diam. (in)	Elev. (ft)	B x h (in)	Elev(1) (ft)	Length(2) (ft)	Elev.(1) (ft)
UG-1	3 x 0.4	0.0	24 x 6	2.20	12	2.70

SAMPLE PROHIBITIVE SIGNAGE
NTS

<u>NOTES:</u>

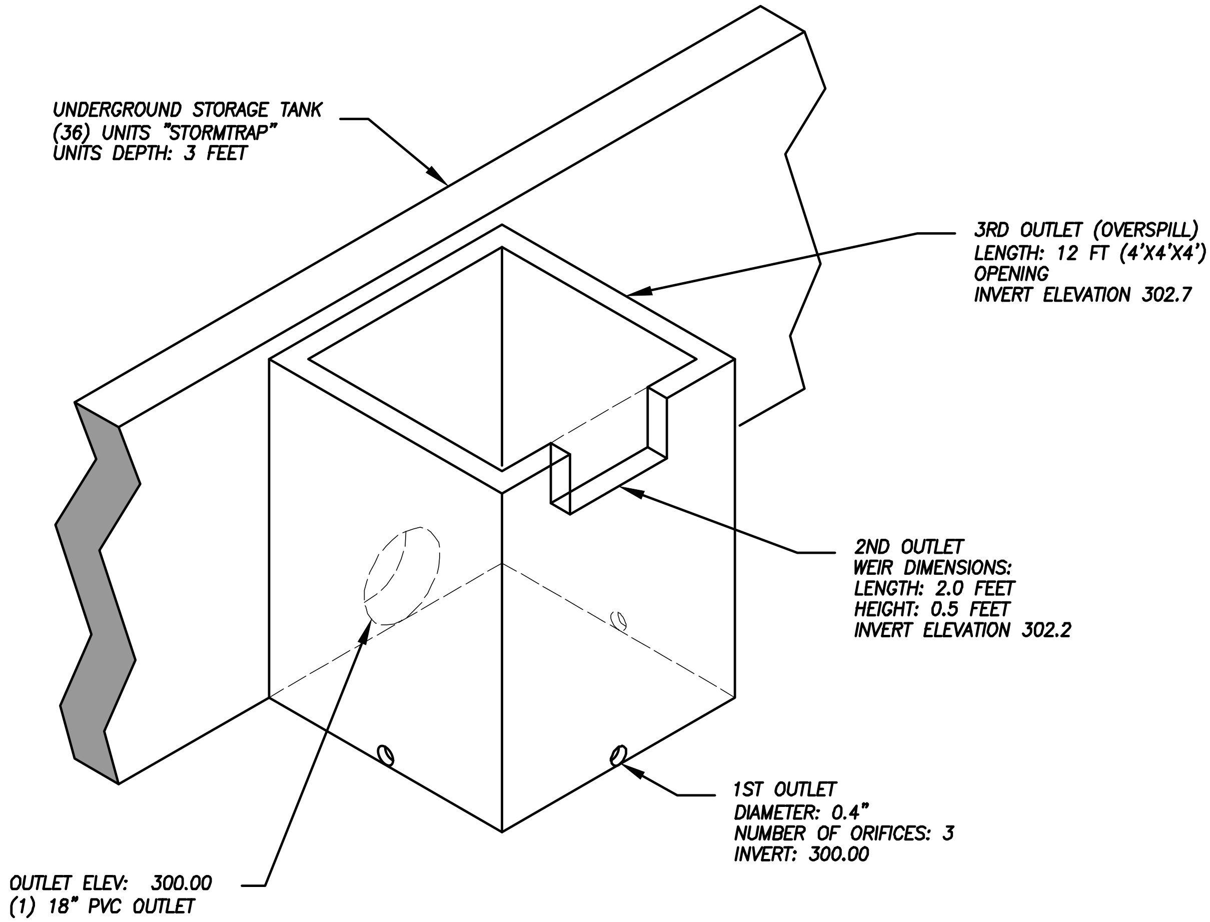
1. THE UNDERLYING SOIL TYPE GROUPS "B" FOR THE ENTIRE PROPERTY AND SURROUNDING PARCELS
2. THE APPROXIMATE DEPTH TO GROUND WATER IS EXPECTED TO BE MORE THAN 15 FEET.
3. NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED BASED ON WMAA MAPS(SEE PROJECT SWQMP).
4. THE SITE DOES NOT CONTAIN ANY EXISTING NATURAL HYDROLOGIC FEATURES. (WATERCOURSES, SEEPS, SPRINGS, WETLANDS.

- EX. AREA BYPASSES AND REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS / DRAINS TO POC 1
- EX. AREA / REMAINS UNCHANGED IN POST DEVELOPMENT CONDITIONS/ DRAINS TO MWS/HMP / DRAINS TO POC 1 (COMMINGLES WITH NEW IMPERVIOUS)
- NEW/REPLACED AREAS (PERVIOUS & IMPERVIOUS) DRAIN TO MWS/HMP/ DRAINS TO POC 1
- BUILDING AREAS (1.5 AC) DRAIN TO SIDE PLANTERS / HMP/ DRAINS TO POC 1

HMP POST DEVELOPMENT

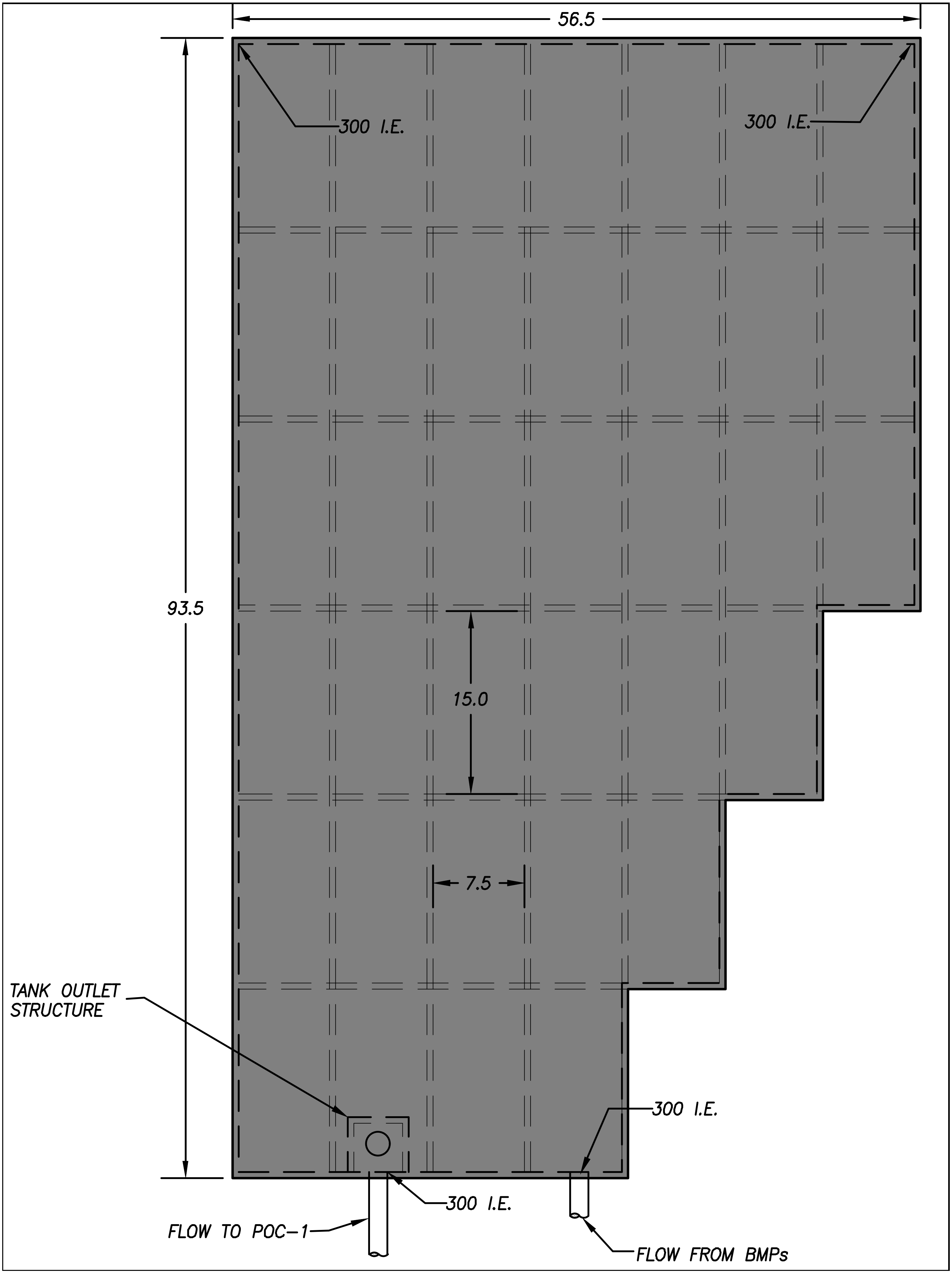
CITY OF SAN DIEGO
CLAIREMONT VILLAGE
3007 CLAIREMONT DRIVE
SAN DIEGO, CA 92117

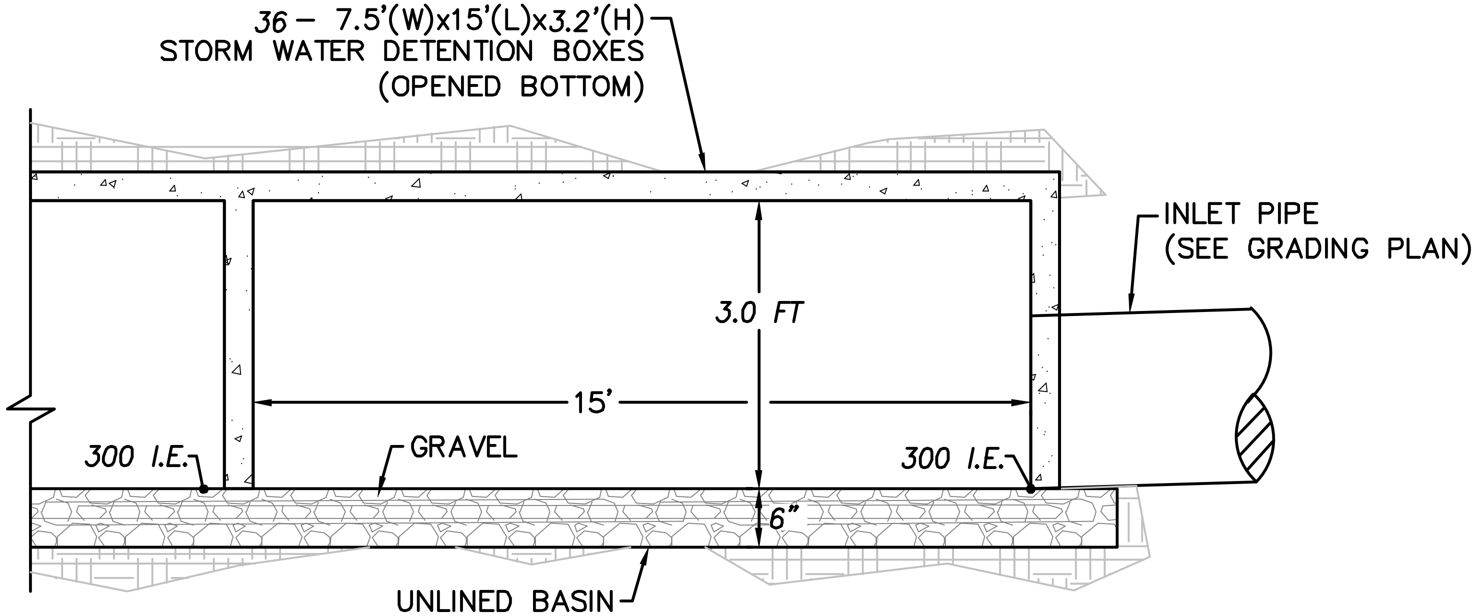
DATE: 08/25/22
DRAWING:
SHEET 1 OF 1



OUTLET DETAIL

NTS


56.5
300 I.E.
300 I.E.
93.5
15.0
7.5
TANK OUTLET
STRUCTURE
300 I.E.
300 I.E.
FLOW TO POC-1
FLOW FROM BMPs



SECTION A-A: UNDERGROUND DETENTION BASIN

NTS

ATTACHMENT 6

SWMM Input Data in Input Format (Existing & Proposed Models)

PRE DEVELOPMENT

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.041  0.076  0.118  0.192  0.237  0.318  0.308  0.286  0.217  0.14
0.067  0.041
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
LINDBERG         INTENSITY 1:00     1.0      TIMESERIES LINDBERG

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- ---
----- ----------------
DMA-1            LINDBERG         POC-1            2.160    0        125      3.1      0
DMA-U            LINDBERG         POC-1            3.265    90       200      2.2      0
DMA-1C           LINDBERG         POC-1            0.466    100      100      2.1      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- -------
---
DMA-1            0.012      0.05       .05        0.1        25         OUTLET
DMA-U            0.012      0.05       .05        0.1        25         OUTLET
DMA-1C           0.012      0.05       .05        0.1        25         OUTLET
```

```
[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA-1            3          0.20       0.32
DMA-U            3          0.20       0.32
DMA-1C           3          0.20       0.32

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LINDBERG         FILE "C:\Users\Parra\Dropbox\AP PROJECTS\100.68 Nova Clairemont\HMP\swmm
\Lindb-N.txt"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2500.000           2700.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            2378.882           6003.106
DMA-1            2378.882           6003.106
DMA-U            1000.000           5984.000
DMA-1C           3596.273           6065.217

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERG         2500.000           7541.713
```

POST DEVELOPMENT

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.041  0.076  0.118  0.192  0.237  0.318  0.308  0.286  0.217  0.14
0.067  0.041
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
LINDBERG         INTENSITY 1:00     1.0      TIMESERIES LINDBERG

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- ---
----- ----------------
DMA-1            LINDBERG         BASIN            2.160    92       125      1.0      0
DMA-U            LINDBERG         POC-1            3.265    90       200      2.2      0
DM-1C            LINDBERG         BASIN            0.466    100      100      2.1      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- -------
---
DMA-1            0.012      0.05       .05        0.1        25         OUTLET
DMA-U            .012       .05        .05        .1         25         OUTLET
DM-1C            0.012      0.05       .05        0.1        25         OUTLET
```

```
[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA-1            3          0.15       0.32       7          0
DMA-U            3          .20        0.32       7          0
DM-1C            3          0.15       0.32       7          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Type/Params
SurDepth  Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ---------- ---------------------------- -
-------- --------          -------- --------
BASIN            0        3.2        0          TABULAR    BASIN
4300      0        3        .20      .32

[OUTLETS]
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ------------
---- ---------- --------
OUTLET           BASIN            POC-1            0          TABULAR/HEAD    OUTLET
NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUTLET           Rating     0.000      0.000
OUTLET                      0.100      0.004
OUTLET                      0.200      0.006
OUTLET                      0.300      0.007
OUTLET                      0.400      0.008
OUTLET                      0.500      0.009
OUTLET                      0.600      0.010
OUTLET                      0.700      0.011
OUTLET                      0.800      0.012
OUTLET                      0.900      0.012
OUTLET                      1.000      0.013
OUTLET                      1.100      0.014
OUTLET                      1.200      0.014
OUTLET                      1.300      0.015
OUTLET                      1.400      0.015
OUTLET                      1.500      0.016
OUTLET                      1.600      0.016
OUTLET                      1.700      0.017
OUTLET                      1.800      0.017
OUTLET                      1.900      0.018
OUTLET                      2.000      0.018
OUTLET                      2.100      0.019
OUTLET                      2.200      0.019
OUTLET                      2.300      0.216
OUTLET                      2.400      0.575
OUTLET                      2.500      1.039
OUTLET                      2.600      1.589
OUTLET                      2.700      2.213
OUTLET                      2.800      4.080
OUTLET                      2.900      6.633
OUTLET                      3.000      9.765
OUTLET                      3.100      13.380
OUTLET                      3.200      17.415
;
BASIN            Storage    0          4300
BASIN                       3.2        4300

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
```

```
LINDBERG         FILE "C:\Users\Parra\Dropbox\AP PROJECTS\100.68 Nova Clairemont\HMP\swmm
\Lindb-N.txt"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2469.410           2235.818
BASIN            2469.410           4649.611

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            2469.410           6484.983
DMA-1            2469.410           6484.983
DMA-U            881.988            6475.155
DM-1C            3478.261           6462.733

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERG         2513.904           7919.911
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), are also shown.

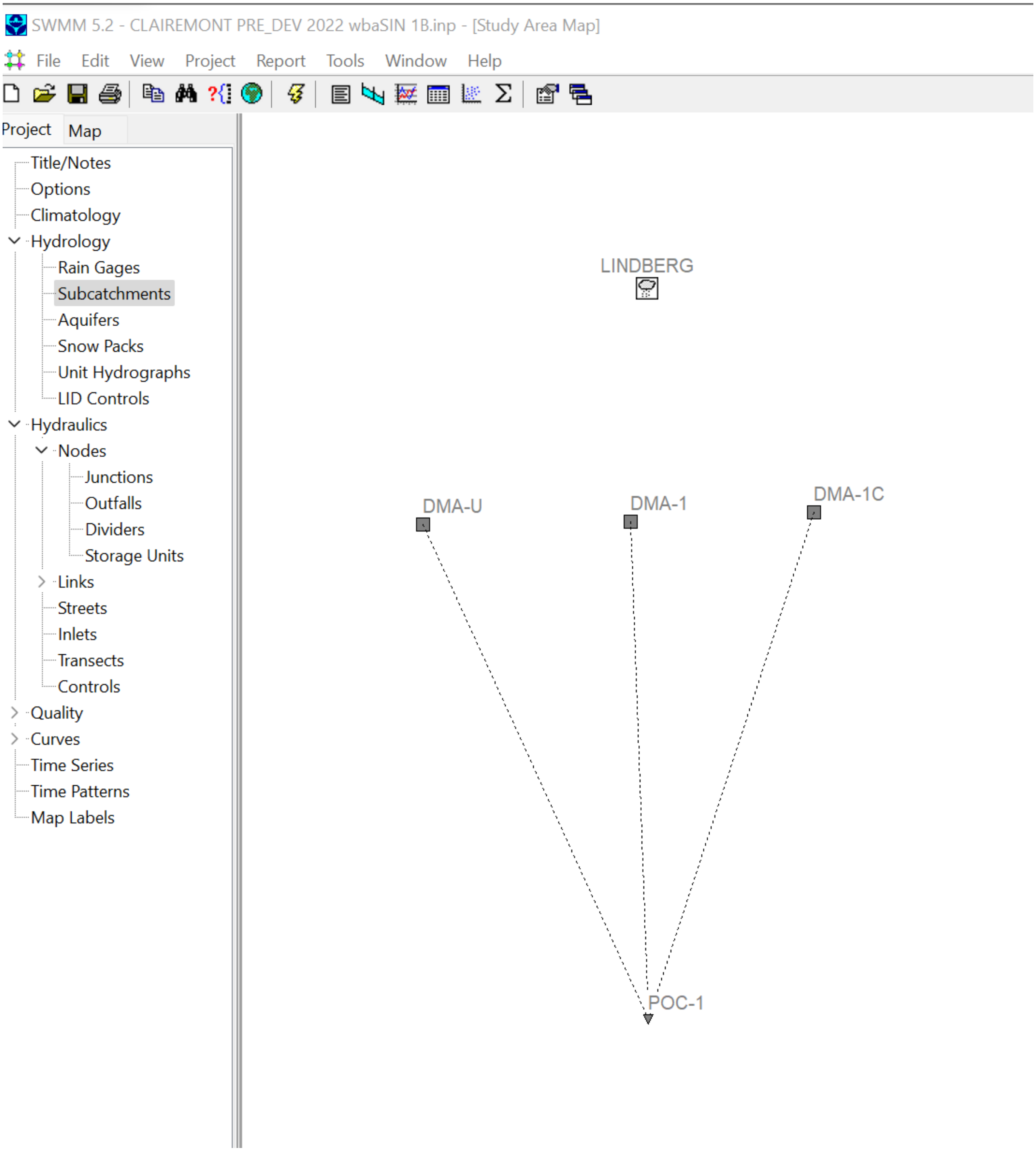
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from Appendix G of the 2021 City of San Diego Stormwater Standards Manual.

Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey and site specific geotechnical report (located in Attachment 8 of this report).

A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

PRE-DEVELOPED CONDITIONS



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	2500.000
Y-Coordinate	2700.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Route To	
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Subcatchment DMA-U

Property	Value
Name	DMA-U
X-Coordinate	1000.000
Y-Coordinate	5984.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	3.265
Width	200
% Slope	2.2
% Imperv	90
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.20
Initial Deficit	0.32

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	2378.882
Y-Coordinate	6003.106
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	2.160
Width	125
% Slope	3.1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

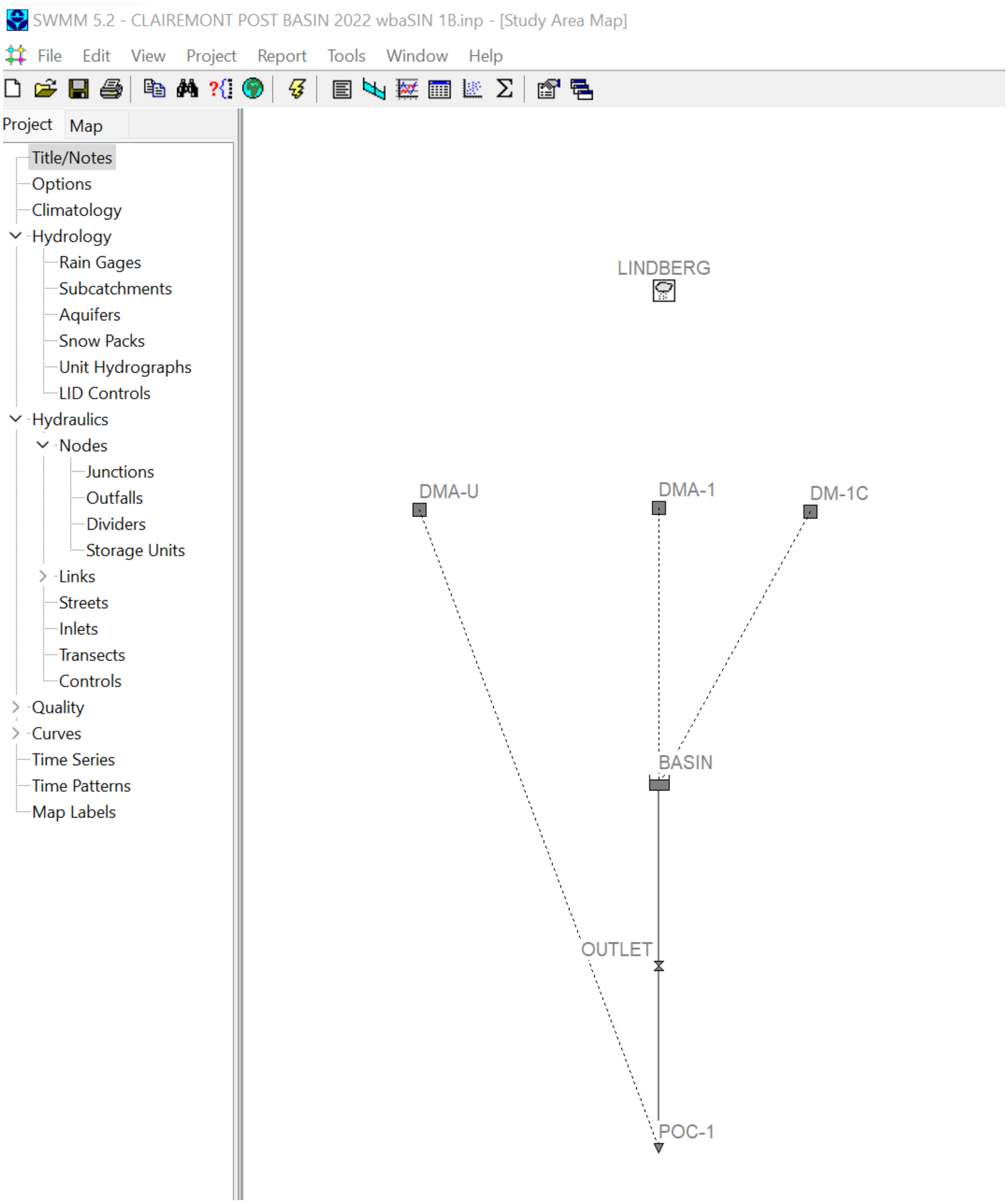
Average surface slope (%)

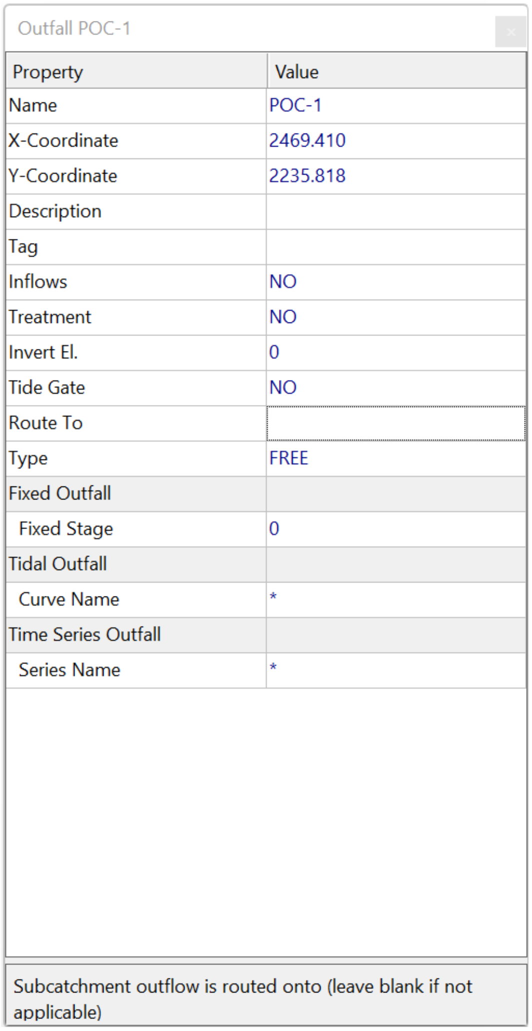
Subcatchment DMA-1C

Property	Value
Name	DMA-1C
X-Coordinate	3596.273
Y-Coordinate	6065.217
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.466
Width	100
% Slope	2.1
% Imperv	100
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Average surface slope (%)

POST-DEVELOPED CONDITIONS

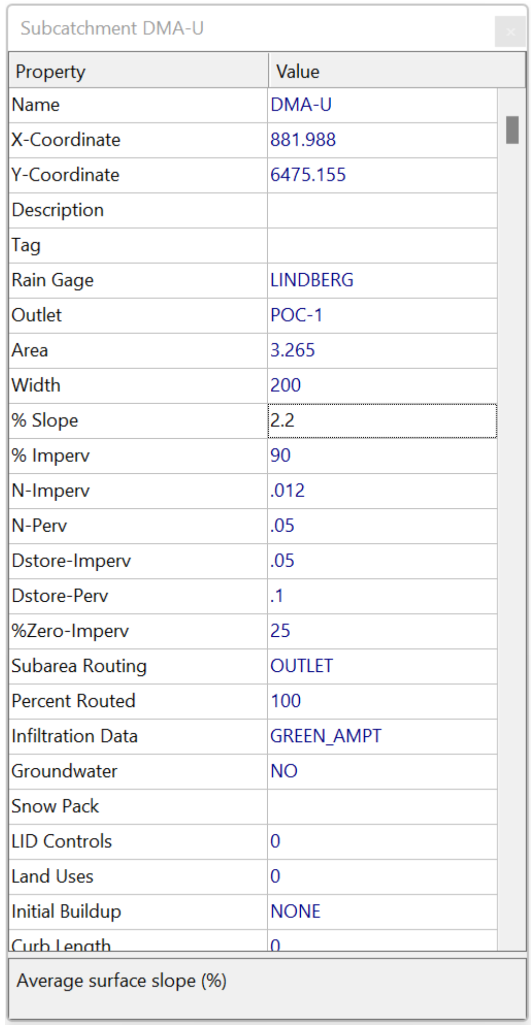




Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	2469.410
Y-Coordinate	2235.818
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Route To	
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

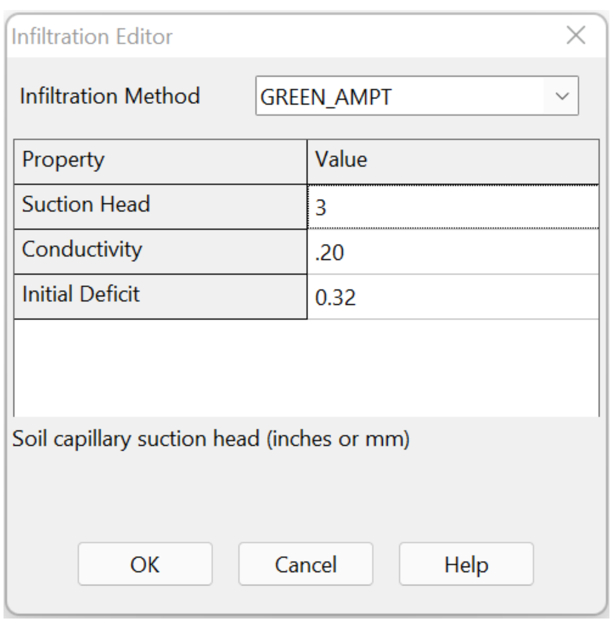
Subcatchment outflow is routed onto (leave blank if not applicable)



Subcatchment DMA-U

Property	Value
Name	DMA-U
X-Coordinate	881.988
Y-Coordinate	6475.155
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	3.265
Width	200
% Slope	2.2
% Imperv	90
N-Imperv	.012
N-Perv	.05
Dstore-Imperv	.05
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Average surface slope (%)



Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	.20
Initial Deficit	0.32

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	2469.410
Y-Coordinate	6484.983
Description	
Tag	
Rain Gage	LINDBERG
Outlet	BASIN
Area	2.160
Width	125
% Slope	1.0
% Imperv	92
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Average surface slope (%)

Subcatchment DM-1C

Property	Value
Name	DM-1C
X-Coordinate	3478.261
Y-Coordinate	6462.733
Description	
Tag	
Rain Gage	LINDBERG
Outlet	BASIN
Area	0.466
Width	100
% Slope	2.1
% Imperv	100
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.15
Initial Deficit	0.32

Soil capillary suction head (inches or mm)

OK Cancel Help

NOTE: Conductivity was reduced 25% in the post project condition as native soils will be compacted.

Storage Unit BASIN

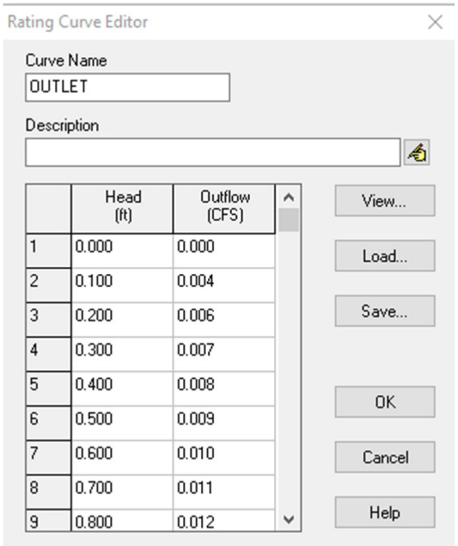
Property	Value
Name	BASIN
X-Coordinate	2469.410
Y-Coordinate	4649.611
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	3.2
Initial Depth	0
Ponded Area	4300
Evap. Factor	0
Infiltration	YES
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN

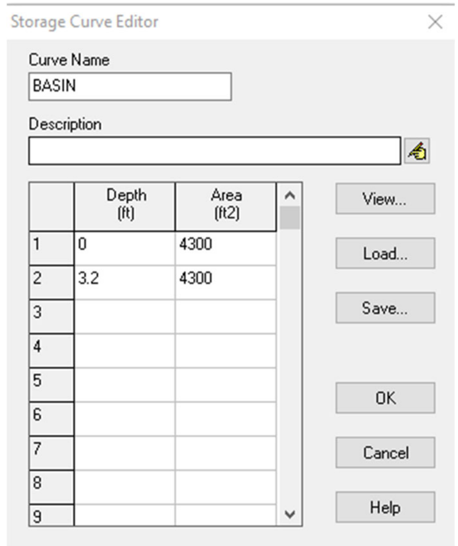
C-value in expression Area = A*Depth^B + C for Depth in ft

Outlet OUTLET

Property	Value
Name	OUTLET
Inlet Node	BASIN
Outlet Node	POC-1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	OUTLET

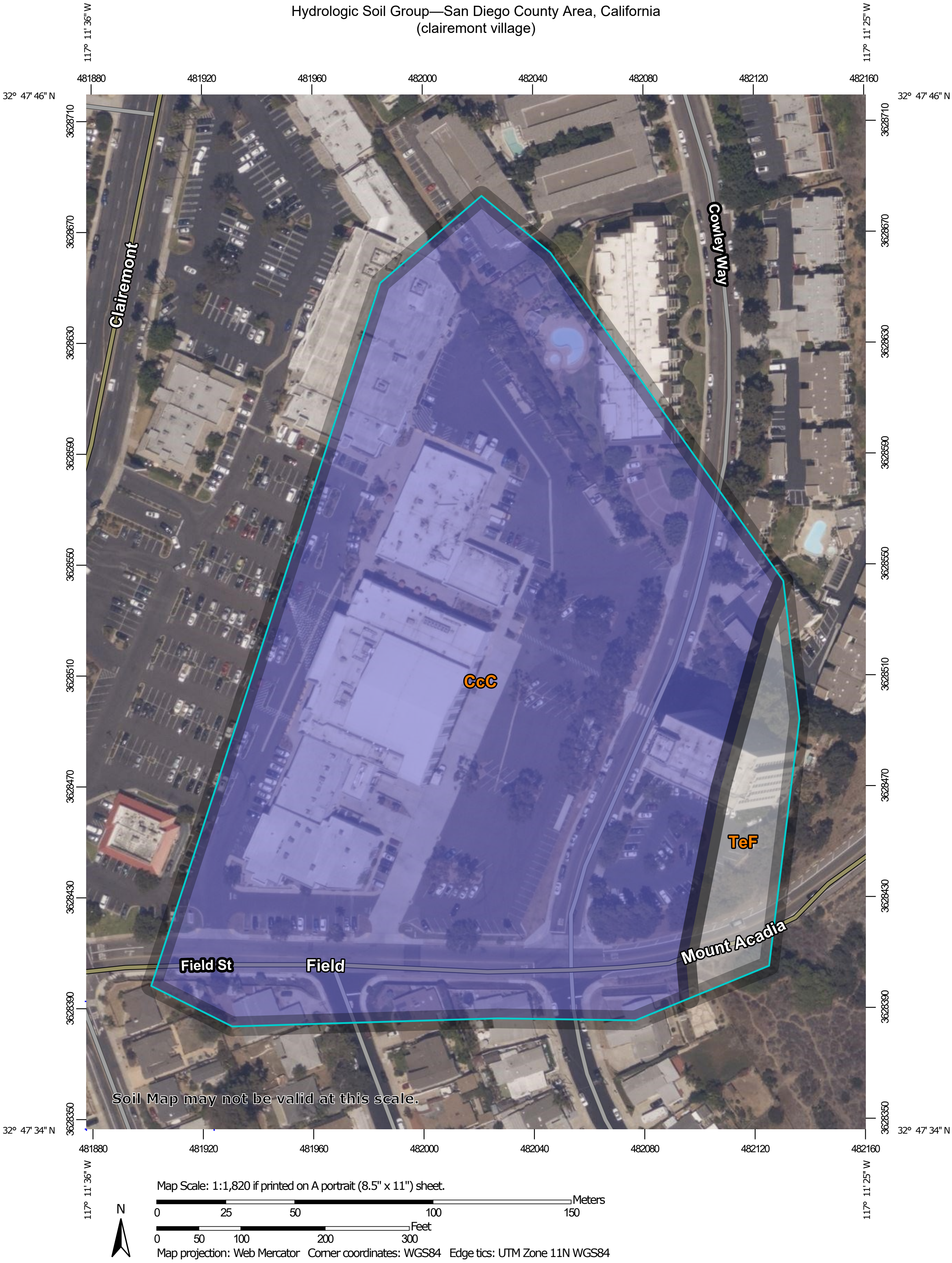
User-assigned name of outlet


Rating Curve Editor
Curve Name
OUTLET
Description
Head (ft)
Outflow (CFS)
1 0.000 0.000
2 0.100 0.004
3 0.200 0.006
4 0.300 0.007
5 0.400 0.008
6 0.500 0.009
7 0.600 0.010
8 0.700 0.011
9 0.800 0.012
View...
Load...
Save...
OK
Cancel
Help


Storage Curve Editor
Curve Name
BASIN
Description
Depth (ft)
Area (ft2)
1 0 4300
2 3.2 4300
3
4
5
6
7
8
9
View...
Load...
Save...
OK
Cancel
Help

ATTACHMENT 8

Geotechnical Documentation



Map Scale: 1:1,820 if printed on A portrait (8.5" x 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:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

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

Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CcC	Carlsbad-Urban land complex, 2 to 9 percent slopes	B	10.9	93.4%
TeF	Terrace escarpments		0.8	6.6%
Totals for Area of Interest			**11.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 9

Summary Files from the SWMM Model

Pre-Development

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.0)
------------------------------------------------------------


****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 10/17/1948 00:00:00
Ending Date .............. 10/17/2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       207.929       423.552
Evaporation Loss .........        37.379        76.141
Infiltration Loss ........        85.962       175.105
Surface Runoff ...........        85.349       173.857
Final Storage ............         0.004         0.008
Continuity Error (%) .....        -0.368


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        85.349        27.812
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        85.349        27.812
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
```

Continuity Error (%) 0.000

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	423.55	0.00	0.78	415.12	0.00	8.00	8.00	0.47	2.74	0.019
DMA-U	423.55	0.00	118.30	41.31	264.98	1.08	266.06	23.59	4.87	0.628
DMA-1C	423.55	0.00	130.12	0.00	296.63	0.00	296.63	3.75	0.70	0.700

Analysis begun on: Mon Apr 25 11:45:16 2022
Analysis ended on: Mon Apr 25 11:45:25 2022
Total elapsed time: 00:00:09

Post-Development

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.0)
------------------------------------------------------------


****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 10/17/1948 00:00:00
Ending Date .............. 10/17/2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       207.929       423.552
Evaporation Loss .........        59.085       120.357
Infiltration Loss ........        17.096        34.824
Surface Runoff ...........       132.760       270.432
Final Storage ............         0.006         0.013
Continuity Error (%) .....        -0.490


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......       132.760        43.262
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        89.872        29.286
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
```

Exfiltration Loss	42.884	13.974
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.003	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	60.00 sec
Average Time Step	:	60.00 sec
Maximum Time Step	:	60.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	1.00
% of Steps Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	423.55	0.00	121.37	32.53	270.03	1.36	271.39	15.92	3.24	0.641
DMA-U	423.55	0.00	118.30	41.31	264.98	1.08	266.06	23.59	4.87	0.628
DM-1C	423.55	0.00	130.12	0.00	296.63	0.00	296.63	3.75	0.70	0.700

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
BASIN	STORAGE	0.02	2.79	2.79	6263 10:01	2.79

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-1	OUTFALL	4.87	8.77	6263 10:01	23.6	29.3	0.000
BASIN	STORAGE	3.95	3.95	6263 10:01	19.7	19.7	0.006

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
BASIN	0.102	1	0	71	12.000	87	6263 10:01	3.94

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	5.63	0.04	8.77	29.284
System	5.63	0.04	8.77	29.284

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
OUTLET	DUMMY	3.90	6263 10:01			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 25 11:56:01 2022
Analysis ended on: Mon Apr 25 11:56:13 2022
Total elapsed time: 00:00:12

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: Clairemont Village Quad

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☐ Included ☐ Not applicable

IN FINAL ENGINEERING

Project Name: Clairemont Village Quad

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

Attachment 3: For private entity operation and maintenance, Attachment 3 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☐ Vicinity map
- ☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☐ BMP and HMP location and dimensions
- ☐ BMP and HMP specifications/cross section/model
- ☐ Maintenance recommendations and frequency
- ☐ LID features such as (permeable paver and LS location, dim, SF).

Modular Wetlands System™ Linear

Biofiltration

Comprehensive Stormwater Solutions

Bio Clean

A Forterra Company

OVERVIEW

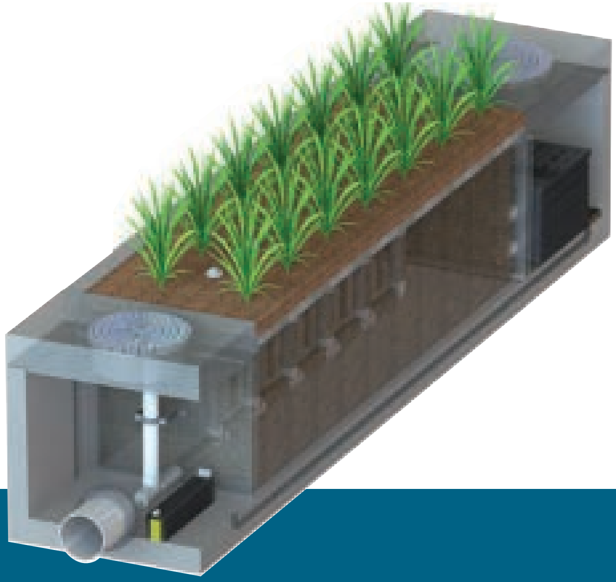
The Bio Clean Modular Wetlands System™ Linear (MWS Linear) represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pretreatment,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

The Urban Impact

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

Plant A Wetland

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



PERFORMANCE

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

66% REMOVAL OF DISSOLVED ZINC	69% REMOVAL OF TOTAL ZINC	38% REMOVAL OF DISSOLVED COPPER	64% REMOVAL OF TOTAL PHOSPHORUS	
45% REMOVAL OF NITROGEN	50% REMOVAL OF TOTAL COPPER	95% REMOVAL OF MOTOR OIL	67% REMOVAL OF ORTHO PHOSPHORUS	85% REMOVAL OF TSS

APPROVALS

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

State of Washington TAPE GULD Basic Enhanced/Metals Phosphorus

WASHINGTON STATE TAPE APPROVED

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

DEQ ASSIGNMENT

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

MARYLAND DEPARTMENT OF THE ENVIRONMENT APPROVED

Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP EVALUATION

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

RHODE ISLAND DEM APPROVED

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

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

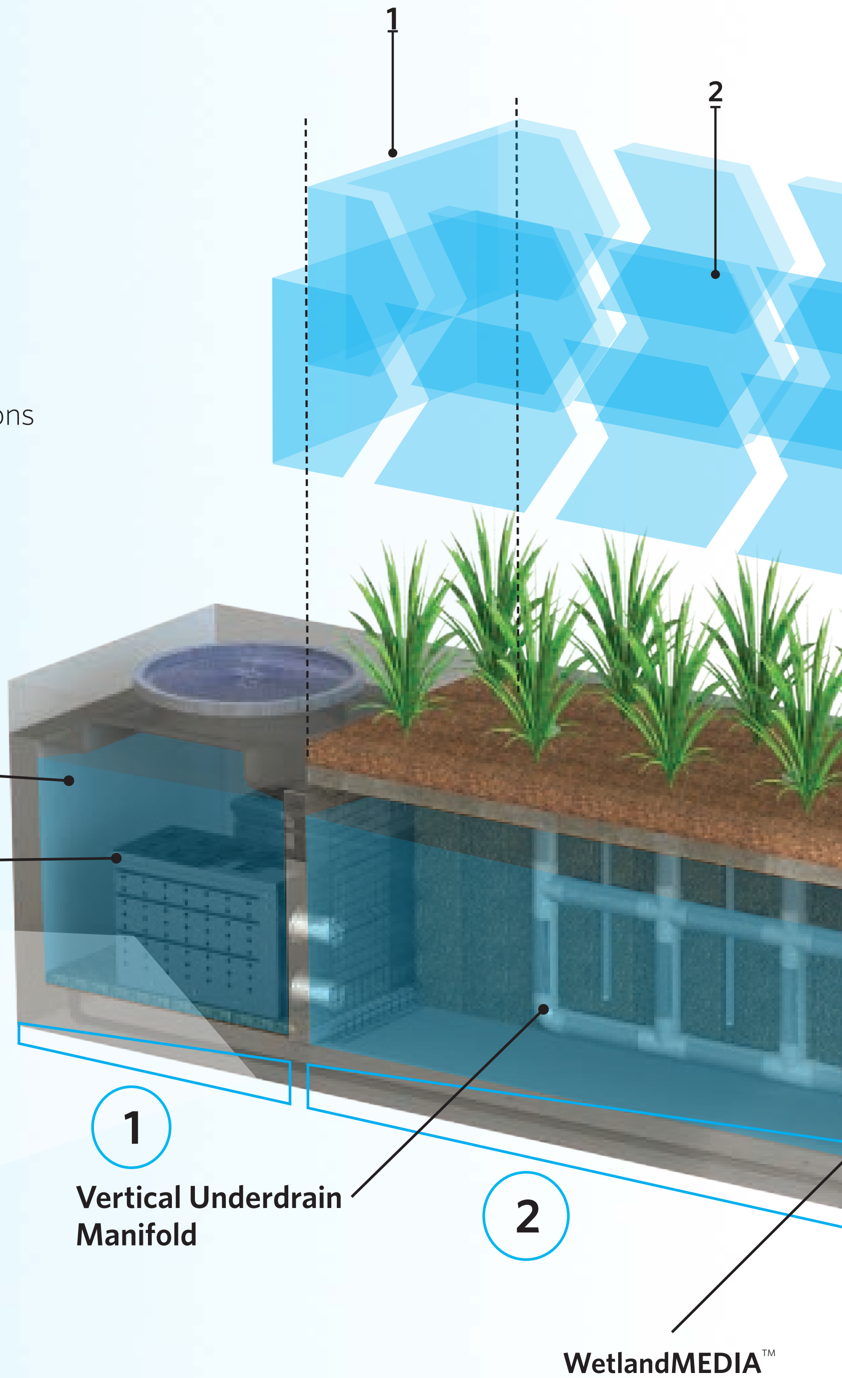
1 PRETREATMENT

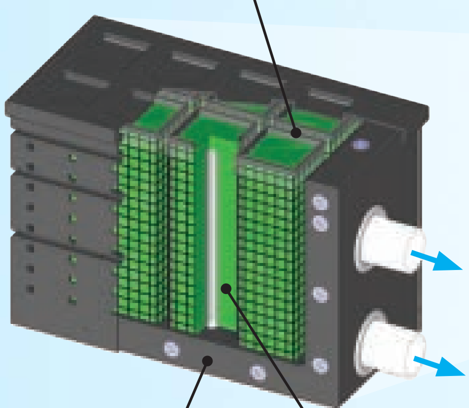
SEPARATION

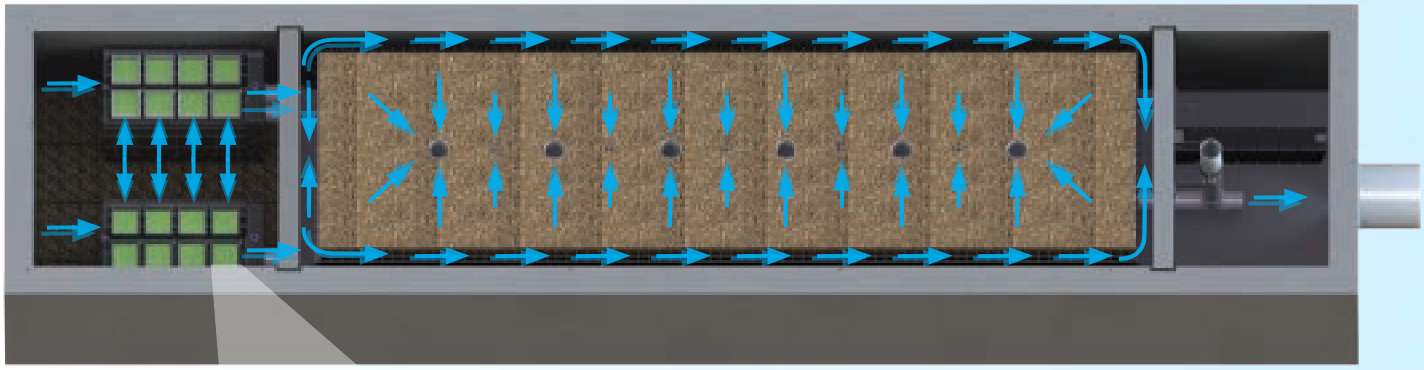
- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

PRE-FILTER CARTRIDGES

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

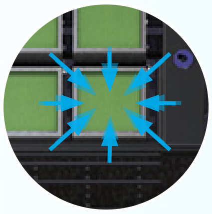






2x to 3x more surface area than traditional downward flow bioretention systems.

Figure 2, Top View



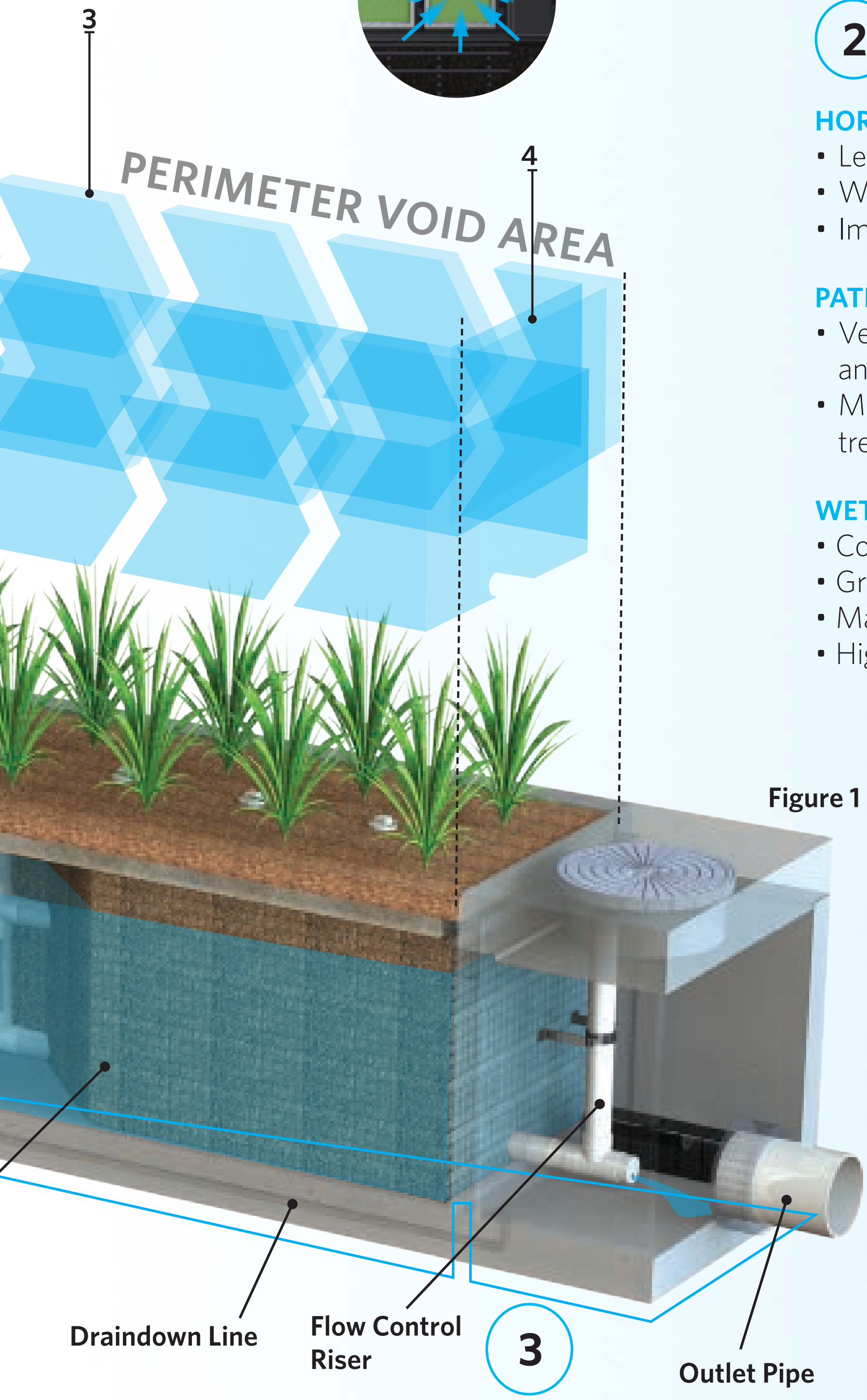


Figure 1

2 BIOFILTRATION

HORIZONTAL FLOW

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

PATENTED PERIMETER VOID AREA

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

WETLANDMEDIA

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

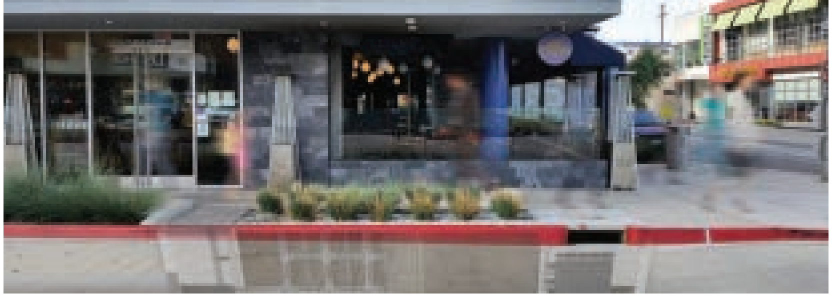
3 DISCHARGE

FLOW CONTROL

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

DRAINDOWN FILTER

- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

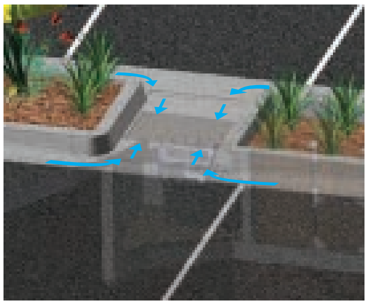


CONFIGURATIONS

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

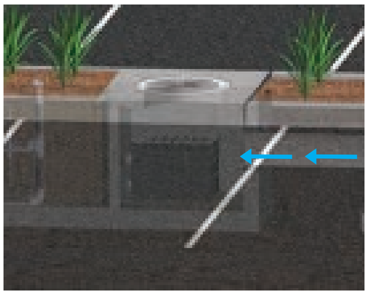
CURB TYPE

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



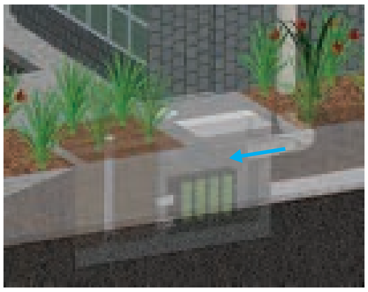
GRATE TYPE

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



VAULT TYPE

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



DOWNSPOUT TYPE

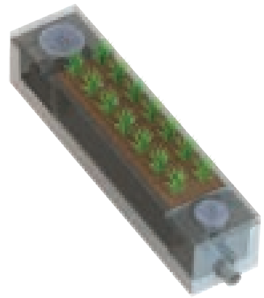
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be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

ORIENTATIONS

SIDE-BY-SIDE

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

END-TO-END



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

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

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

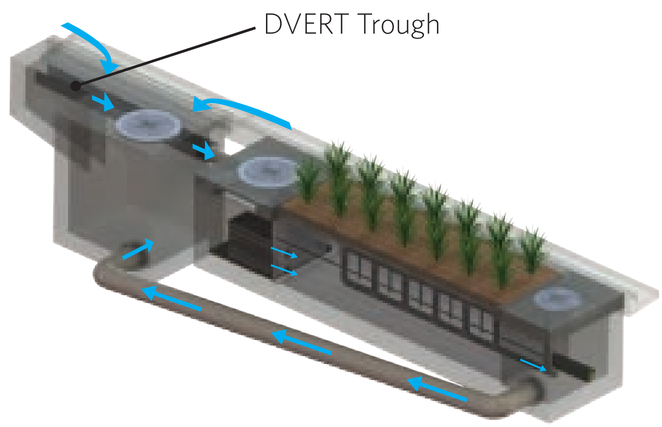
EXTERNAL DIVERSION WEIR STRUCTURE

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

FLOW-BY-DESIGN

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

DVERT LOW FLOW DIVERSION



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

APPLICATIONS

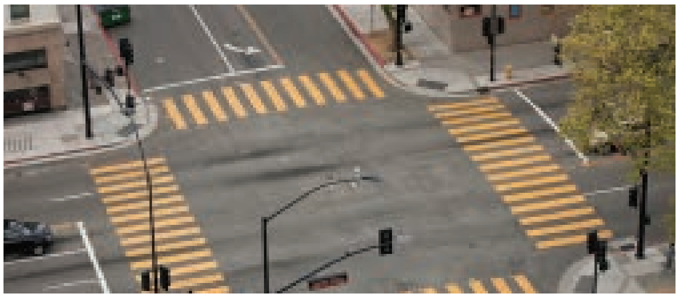
The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

INDUSTRIAL

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

RESIDENTIAL

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

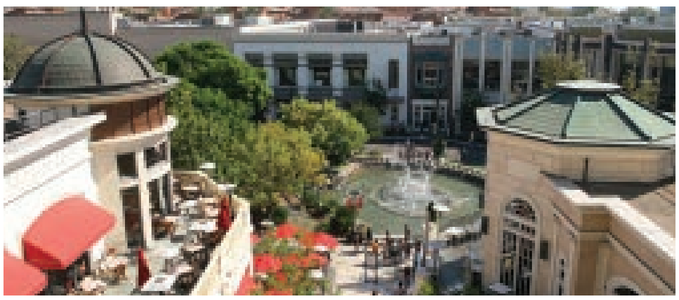


STREETS

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

PARKING LOTS

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



COMMERCIAL

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

MIXED USE

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

More applications include:

- Agriculture
- Reuse
- Low Impact Development
- Waste Water

PLANT SELECTION

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

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

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

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

MAINTENANCE

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

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

Bio Clean
A Forterra Company

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biocleanenvironmental.com

072318R1

TAPE PERFORMANCE SUMMARY

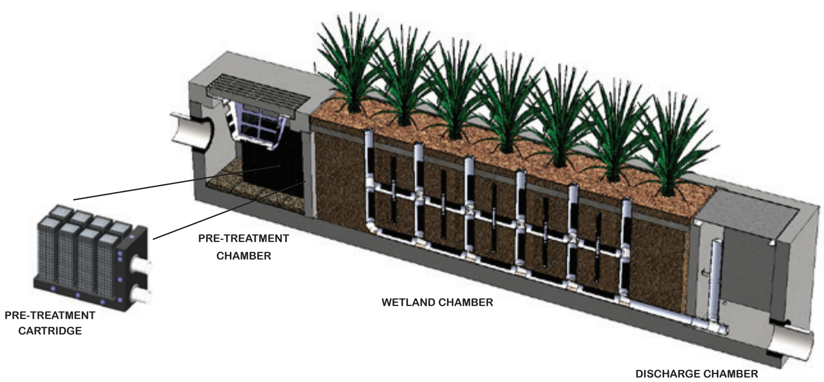
MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.



TAPE PERFORMANCE

Modular Wetland System Linear 2.0 (MWS-L 2.0) completed its TAPE field testing in the spring of 2013. The Washington DOE has approved the system under the TAPE protocol. The MWS-Linear has met the performance benchmarks for the three major pollutant categories as defined by TAPE: Basic Treatment (TSS), Phosphorus and Enhanced (dissolved zinc and copper). It is the first system tested under the protocol to meet the benchmarks for all three categories.

Pollutant	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Total Suspended Solids	75.0	15.7	85%	Summary of all data meeting TAPE parameters pertaining to this pollutant. Mean of 8 microns.
Total Phosphorus	0.227	0.074	64%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Ortho Phosphorus	0.093	0.031	67%	Summary of all data meeting TAPE parameters for total phosphorus.
Nitrogen	1.40	0.77	45%	Utilizing the Kjeldahl method (Total Kjeldahl nitrogen). Summary of all data during testing.
Dissolved Zinc	0.062	0.024	66%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Dissolved Copper	0.0086	0.0059	38%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Total Zinc	0.120	0.038	69%	Summary of all data during testing.
Total Copper	0.017	0.009	50%	Summary of all data during testing.
Motor Oil	24.157	1.133	95%	Summary of all data during testing.

NOTES:
1. The MWS-Linear was proven effective at infiltration rates of up to 121 in/hr.
2. A minimum of 10 aliquots were collected for each event.
3. Sampling was targeted to capture at least 75 percent of the hydrograph.

Modular Wetland System, Inc.
2972 San Luis Rey Rd
Oceanside, CA 92058

MODULAR WETLANDS™
Nature & Technology Working Together In Perfect Harmony™

www.modularwetlands.com
P 760-433-7640
F 760-433-3179

PERFORMANCE SUMMARY

MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

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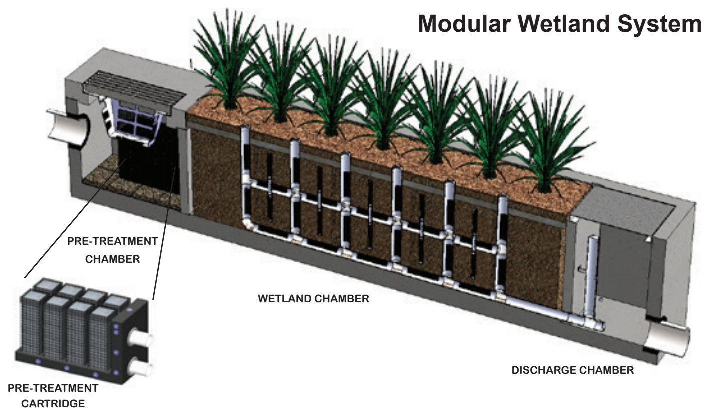

Modular Wetland System Linear 2.0 (MWS-L 2.0) has been independently tested in laboratory and field conditions since 2008.

Oceanside Test Site

Portland Test Site

HEAVY METALS: Copper / Zinc

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.76 / .95	.06 / .19	92% / 80%	Majority Dissolved Fraction
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.04 / .24	< .02 / < .05	>50% / >79%	Effluent Concentrations Below Detectable Limits
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.058 / .425	.032 / .061	44% / 86%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	.017/ .120	.009 / .038	50% / 69%	Total Metals

TOTAL SUSPENDED SOLIDS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	270	3	99%	Sil-co-sil 106 - 20 micron mean particle size
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	45.67	8.24	82%	Mean Particle Size by Count < 8 Microns
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	676	39	94%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	75.0	15.7	85%	Means particle size of 8 microns

Modular Wetland System, Inc.
2972 San Luis Rey Rd
Oceanside, CA 92058

MODULAR WETLANDS™
Nature & Technology Working Together In Perfect Harmony™

www.modularwetlands.com
P 760-433-7640
F 760-433-3179

PERFORMANCE SUMMARY

MWS-LINEAR 2.0

PHOSPHORUS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
TAPE Field Testing / Portland, OR 2011/2012	Field	.227	.074	64%	TOTAL P
TAPE Field Testing / Portland, OR 2011/2012	Field	.093	.031	67%	ORTHO P

BACTERIA:

Description	Type	Avg. Influent (MPN)	Avg. Effluent (MPN)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	1600 / 1600	535 / 637	67% / 60%	Fecal / E. Coli
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	31666 / 6280	8667 / 1058	73% / 83%	Fecal / E. Coli

LEAD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.54	.10	82%	Total
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.01 / .043	.004 / .014	60% / 68%	Both Test Units
TAPE Field Testing / Portland, OR 2011/2012	Field	.011	.003	70%	Total

NITROGEN:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.85	.21	75%	NITRATE
TAPE Field Testing / Portland, OR 2011/2012	Field	1.40	0.77	45%	TKN

HYDROCARBONS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	10	1.625	84%	Oils & Grease
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.83	0	100%	TPH Motor Oil
TAPE Field Testing / Portland, OR 2011/2012	Field	24.157	1.133	95%	Motor Oil

TURBIDITY:

Description	Type	Avg. Influent (NTU)	Avg. Effluent (NTU)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	21	1.575	93%	Field Measurement
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	21	6	71%	Field Measurement

COD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	516 / 1450	90 / 356	83% / 75%	Both Test Units

All removal efficiencies and concentrations rounded up for easy viewing. Please call us for more information, including full copies of the reports reference above.

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2972 San Luis Rey Rd
Oceanside, CA 92058

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F 760-433-3179

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name: Clairemont Village Quad

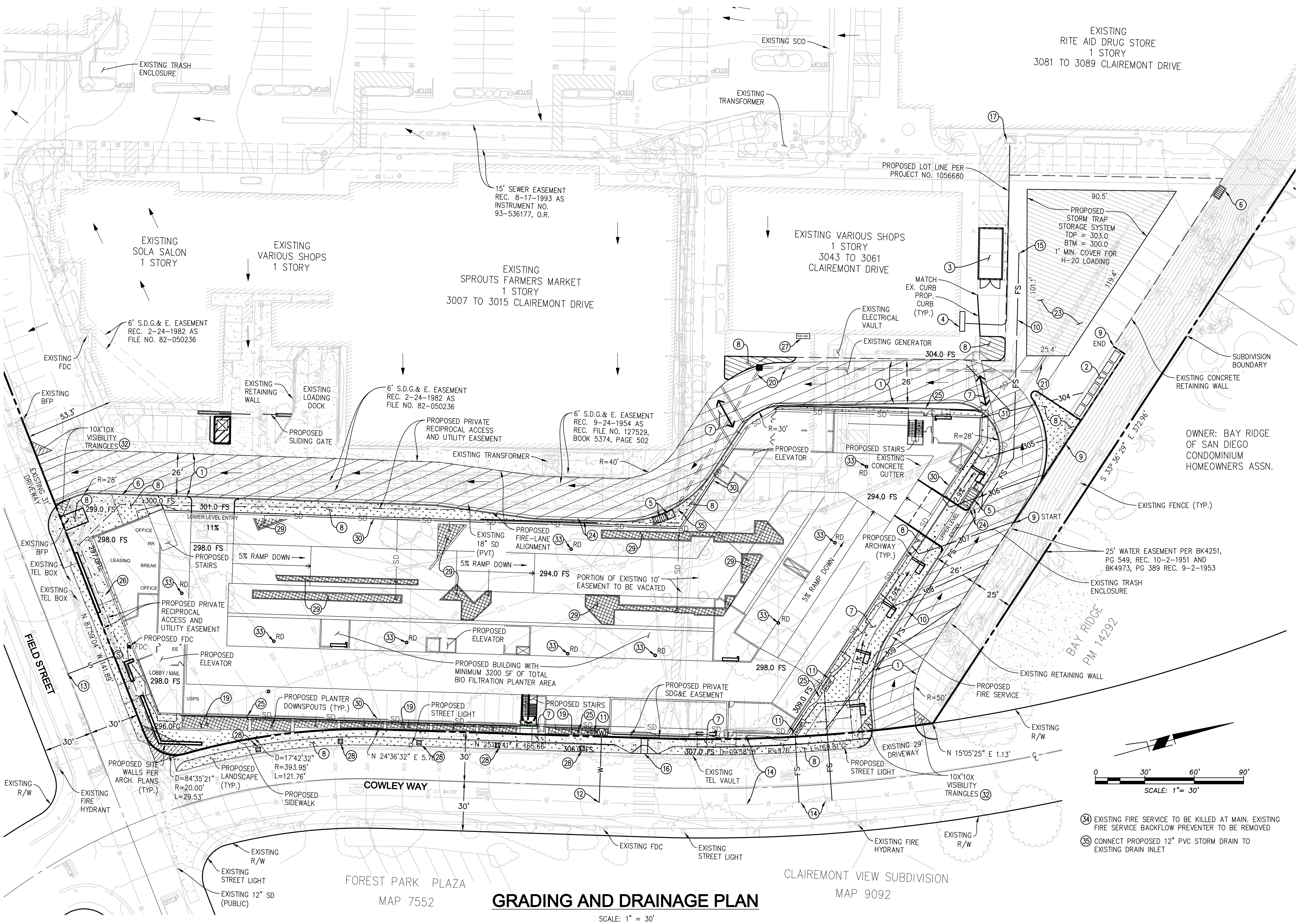
Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- ☐ Structural BMP(s) with ID numbers matching Form I-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 the City Engineer
- ☑ 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 shall be provided. Broucher photocopies are not allowed.

NEIGHBORHOOD DEVELOPMENT PERMIT

CLAIREMONT VILLAGE



GRADING AND DRAINAGE PLAN

SCALE: 1" = 30'

LEGEND

ITEM	SYMBOL
EXISTING BUILDING	
EXISTING WALL	
EXISTING DOMESTIC WATER LINE	W
EXISTING FIRE SERVICE LINE	F
EXISTING SANITARY SEWER	S
EXISTING STORM DRAIN LINE	SD
EXISTING ELECTRICAL LINE	E
EXISTING GAS LINE	G
EXISTING TELECOMMUNICATION LINE	T
EXISTING FIBER OPTIC LINE	F/O
EXISTING CONCRETE PAVEMENT	
EXISTING FIRE HYDRANT	
EXISTING POWER POLE	
EXISTING STREET LIGHT (150W HPS)	
EXISTING CONTOUR	312
EXISTING EASEMENT	
EXISTING TREE	
PROPERTY LINE	P/L
RIGHT-OF-WAY LINE	R/W
PROPOSED EASEMENT	
PROPOSED CONTOUR	312
PROPOSED FIRE SERVICE	FS (F)
PROPOSED WATER LATERAL	W (W)
PROPOSED SEWER LATERAL	S (S)
DIRECTION OF DRAINAGE FLOW	
VISIBILITY TRIANGLES 10'X10'/25'X25'	
PROPOSED 150 WATT HPS STREET LIGHT	
PROPOSED BACKFLOW PREVENTER	

CONSTRUCTION NOTES

1. PROPOSED FIRE-LANE ALIGNMENT
2. PROPOSED TRASH BINS AND ENCLOSURE
3. PROPOSED GENERATOR LOCATION
4. PROPOSED 800 AMPS 277/480 2'X5' PAD
5. PROPOSED CURB INLET AND MODULAR WETLAND SYSTEM
6. PROPOSED STORM DRAIN INLET
7. PROPOSED ADA CROSSWALK
8. PROPOSED LANDSCAPE PER LANDSCAPE PLANS
9. PROPOSED RETAINING WALL MAXIMUM HEIGHT 6'
10. PROPOSED FIRE SERVICE
11. PROPOSED BACKFLOW PREVENTER
12. PROPOSED WATER LATERAL CONNECT TO EXISTING 8" C.I. WATER MAIN
13. PROPOSED SEWER LATERAL CONNECT TO EXISTING SEWER MAIN
14. PROPOSED FIRE SERVICE CONNECT TO EXISTING 8" C.I. WATER MAIN
15. PROPOSED FIRE SERVICE CONNECT TO EXISTING FIRE SERVICE
16. PROPOSED CURB RAMP
17. PROPOSED ELECTRICAL LINE CONNECT TO EXISTING TRANSFORMER
18. PROPOSED RECYCLING CENTER
19. PROPOSED ELEVATED BIOFILTRATION PLANTERS HUNG FROM EAST SIDE OF STRUCTURE
20. PROPOSED 12" STORM DRAIN (PVT)
21. PROPOSED STORM TRAP OUTLET PIPE CONNECT TO EXISTING DI FL = 300.0
22. PROPOSED STORM DRAIN PIPE FROM BUILDING TO STORM TRAP
23. PROPOSED STORM TRAP UNIT
24. PROPOSED CURB AND GUTTER
25. PROPOSED POP OUT PLANTER
26. PROPOSED ARCHITECTURAL HALF WALL
27. PROPOSED ELECTRICAL ENCLOSURE
28. PROPOSED TREE PLANTERS PER LANDSCAPE PLANS
29. PROPOSED RAISED BIOFILTRATION PLANTERS LOCATED ON UPPER LEVEL PODIUM DECK
30. PROPOSED BIOFILTRATION PLANTER PVC SD DISCHARGE PIPE ROUTED IN OVERHEAD OF 2ND FLOOR PARKING, TIGHT TO PERIMETER WALL. EXACT ROUTING PER PLUMBING DESIGNER.
31. BIOFILTRATION PLANTER SD DISCHARGE RISER PIPE TO ROUTE UNDERGROUND AT THIS LOCATION AND GRAVITY FLOW TO PROPOSED STORM TRAP STORAGE SYSTEM
32. NO FENCES/SHRUBS OR ANY OBJECTS HIGHER THAN 24 INCHES ARE PROPOSED WITHIN THE VISIBILITY TRIANGLE AREAS OF THE EXISTING AND PROPOSED DRIVEWAYS AND STREET INTERSECTIONS
33. ROOF DRAINS TO BE ROUTED TO BIOFILTRATION PLANTER VIA INTERNAL PIPES PER BUILDING PLUMBING PLANS.
34. EXISTING FIRE SERVICE TO BE KILLED AT MAIN. EXISTING FIRE SERVICE BACKFLOW PREVENTER TO BE REMOVED
35. CONNECT PROPOSED 12" PVC STORM DRAIN TO EXISTING DRAIN INLET

FINAL DISCHARGE NOTE

THE FINAL DISCHARGE POINT IS THE EXISTING GRATE AT THE SOUTH EASTERLY CORNER OF THE SITE THE RUN OFF DISCHARGE INTO THE EXISTING 12" STORM DRAIN (PUBLIC) ACROSS COWLEY WAY AND FIELD STREET.

PREPARED BY:

NOVA Engineering

4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123
(619) 296-1010

REGISTERED PROFESSIONAL ENGINEER MELLOR R. LANDY No. 81085 Exp. 09-30-23 CIVIL STATE OF CALIFORNIA

PROJECT NAME: CLAIREMONT VILLAGE

SHEET TITLE: GRADING AND DRAINAGE PLAN

DATE PREPARED: MAY 3, 2022

NO.	DATE	REVISION
1	09/15/2021	1ST SUBMITTAL
2	05/03/2022	REVISION 1
3		

SITE DEVELOPMENT PERMIT

CLAIREMONT VILLAGE

ABBREVIATIONS:

AC	ASPHALT CONCRETE
APN	ASSESSOR'S PARCEL NUMBER
ASPH	ASPHALT
BLDG	BUILDING
BFP	BACKFLOW PREVENTER
BW	BOTTOM OF WALL FG
℄	CENTERLINE
CONC	CONCRETE
DWY	DRIVEWAY
ESMT	EASEMENT
EX/EXIST/(E)	EXISTING
FDC	FIRE DEPARTMENT CONNECTION
FG	FINISHED GRADE
FL	FLOW LINE
FH	FIRE HYDRANT
FS	FINISHED SURFACE
GF	GARAGE FLOOR
IE	INVERT ELEVATION
INV	INVERT
LAT	LATERAL
ℙ	PROPERTY LINE
PROJ	PROJECT
PROP	PROPOSED
PUB	PUBLIC
PVT	PRIVATE
RD	ROOF DRAIN
RET	RETAINING
RIM	TOP OF RIM
R/W	RIGHT OF WAY
SB	SETBACK
SD	STORM DRAIN
TEL	TELEPHONE
TW	TOP OF WALL FG
TYP	TYPICAL
VAR	VARIES

PROJECT DESCRIPTION:

A 5 STORY TYPE III–A RESIDENTIAL BUILDING CONSISTING OF 224 UNITS OVER 2 STORY TYPE I PARKING STRUCTURE WITH 351 PARKING STALLS.

PRELIMINARY GRADING PLAN NOTES:

1. THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN A VALID GRADING PERMIT BEFORE COMMENCING SUCH ACTIVITY.
2. ALL EXISTING & PROPOSED UTILITIES SHALL BE UNDERGROUND. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE CITY ENGINEER, PUBLIC UTILITIES AND THEIR APPROPRIATE DISTRICTS.
3. SOURCE OF TOPOGRAPHY: NOVA ENGINEERING – AERIAL – DATED 8–6–19
4. CONTOURED INTERVALS: 1 FEET (EXISTING) AND 1 FEET (PROPOSED)
5. MANUFACTURED SLOPE RATIOS SHALL BE VARIABLE PER PGP (2:1 MAX.)
6. FINISHED GRADES ARE APPROXIMATE ONLY AND SUBJECT TO CHANGE AT FINAL DESIGN, CONSISTENT WITH THE CITY'S SUBSTANTIAL CONFORMANCE GUIDELINES.
7. SOIL INFORMATION WAS OBTAINED FROM THE GEOLOGIC RECONNAISSANCE REPORT PREPARED BY: GEOCON INC. DATED: 10/28/2021
8. STORM DRAIN DETENTION SHALL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY.
9. THIS PROJECT IS SUBJECT TO UTILIZING LOW IMPACT DESIGN TECHNIQUES IN CONTAINING STORM WATER ON SITE PER THE SATISFACTION OF CITY ENGINEER.
10. LANDSCAPE AREAS ADJACENT TO COWLEY WAY SHALL BE DESIGNED SO THAT FERTILIZERS, PESTICIDES, OR SUBSTANCES CONTAINING THE POLLUTANTS OF CONCERN DO NOT NEED TO BE ADDED TO THE SUBJECT LANDSCAPED AREAS. THE GRADING AND IRRIGATION SYSTEMS FOR THESE AREAS SHALL BE DESIGNED TO PREVENT RUNOFF OF IRRIGATION WATER.
11. PRIOR TO ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITEE SHALL SUBMIT WATER POLLUTION CONTROL PLAN (WPCP). THE WPCP SHALL BE PREPARED IN ACCORDANCE WITH THE GUIDELINES IN PART 2 CONSTRUCTION BMP STANDARDS CHAPTER 4 OF THE CITY'S STORM WATER STANDARDS.

SITE SUMMARY:

PROJECT TEAM

CIVIL ENGINEER
NOVA ENGINEERING
4373 VIEWRIDGE AVENUE
SAN DIEGO, CA 92123
619–296–1010

ARCHITECTURAL DESIGNER
AO ARCHITECTS
144 NORTH ORANGE STREET
ORANGE, CA 92866
714–639–9860

OWNER

CLAIREMONT VILLAGE QUAD, LLC
12625 HIGH BLUFF DRIVE, SUITE 310
SAN DIEGO, CA 92130
858–481–3081

LEGAL DESCRIPTION

PARCEL 1 OF PARCEL MAP NO. 13891, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, JULY 31, 1985 AS INSTRUMENT NO. 85–274379 OF OFFICIAL RECORDS

BASE ZONE

CC–1–3/RM 2–5

EXISTING USE

COMMERCIAL PARKING LOT

PROPOSED USE

MULTI–FAMILY RESIDENTIAL

AREA OF IMPACT

2.67 AC

GRADING QUANTITIES

29,000 CY CUT
3,000 CY FILL
26,000 CY EXPORT

GENERAL NOTES:

EXISTING TRANSIT STOP IS LOCATED ALONG CLAIREMONT DRIVE APPROXIMATELY 710' AWAY FROM THE LOBBY ENTRANCE OF THE PROPOSED 5 STORY BUILDING.

TOPOGRAPHY SOURCE:

NOVA ENGINEERING
AERIAL TOPOGRAPHY
DATE: 8/6/2019
DATUM: NGVD 29

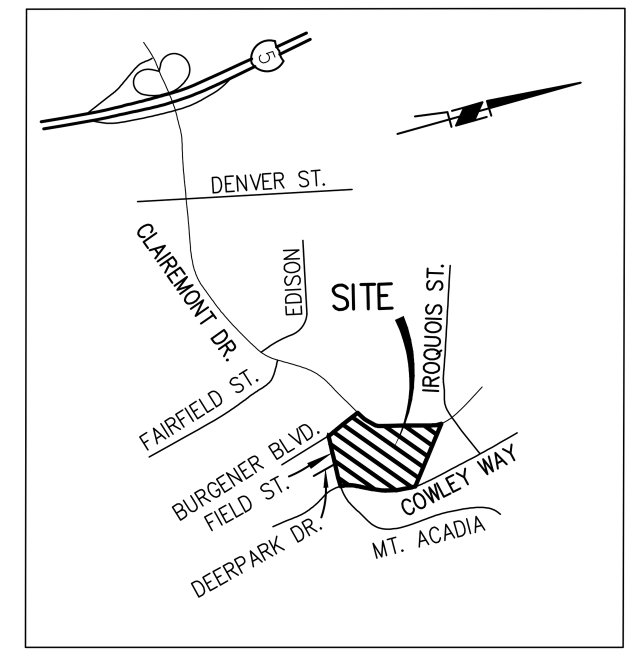
BENCHMARK:

CITY OF SAN DIEGO, BENCHMARK SWBP AT THE INTERSECTION OF COWLEY WAY AND FIELD STREET

ELEVATION: 295.29'
DATUM: M.S.L.

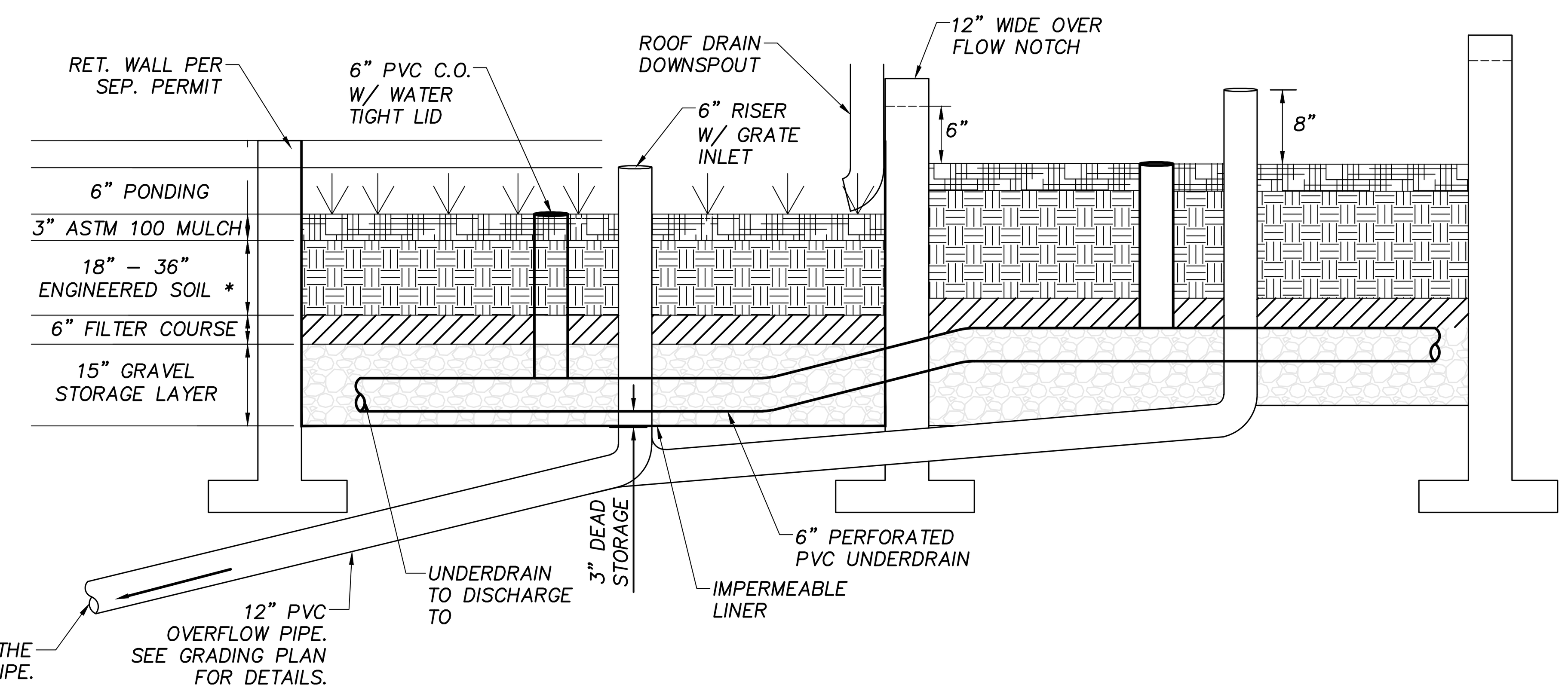
ASSESSOR'S PARCEL NO.:

425–680–09 & 425–680–10



VICINITY MAP
NO SCALE

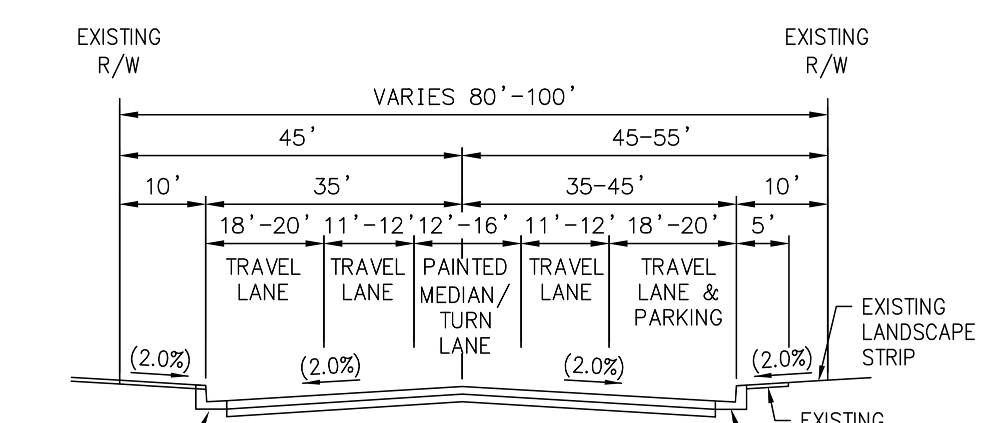
SHEET INDEX	
SHEET NUMBER	SHEET TITLE
C–4	COVER
C–5	GRADING AND DRAINAGE PLAN
C–6	OVERALL SITE PLAN
C–7	SITE PLAN



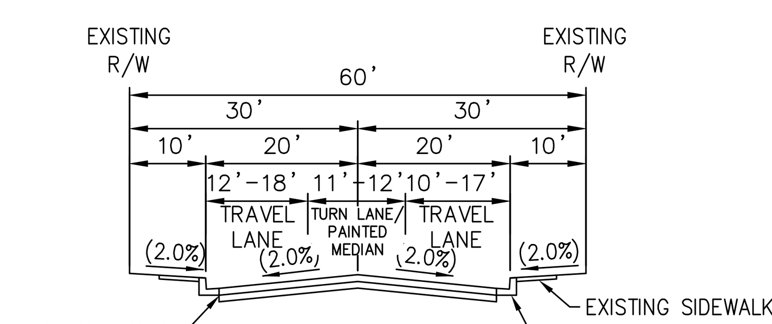
MEDIA SPECIFICATION:

18" ENGINEERED SOIL MEDIA CONSISTS OF 80% SAND, 8" SILT, 3% CLAY AND 9% COMPOST BY WEIGHT.
6" FILTER COURSE CONSISTS OF 3" CLEAN AND WASHED ASTM 33 FINE AGGREGATE SAND OVER 3" OF ASTM NO. 8 STONE.
15" GRAVEL STORAGE LAYER CONSISTS OF CLEAN ¾" GRAVEL.
* 18" MIN. ESM FOR SMALL PLANTS, 36" MIN. FOR SHRUBS AND TREES

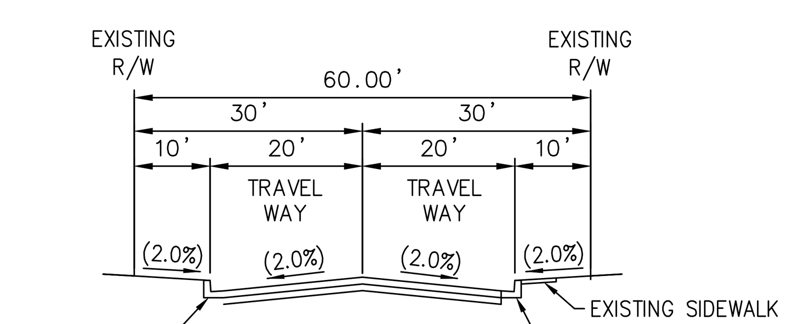
SECTION: BIOFILTRATION PLANTER
SCALE: NTS



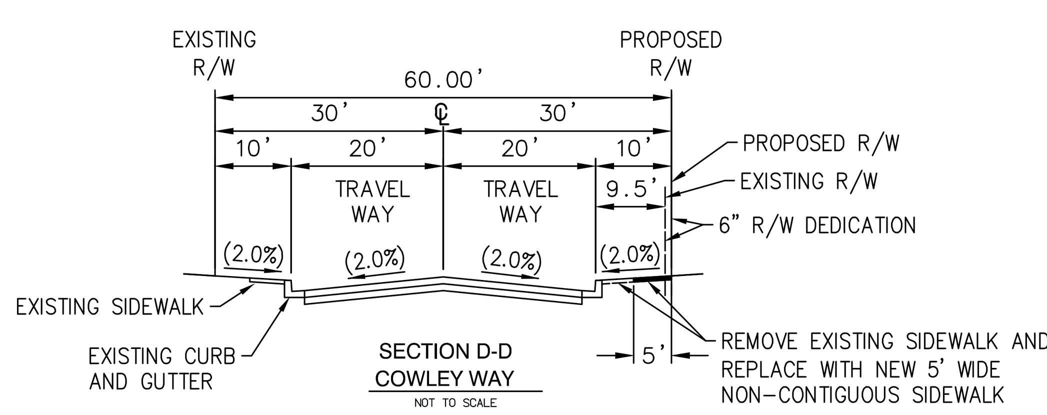
SECTION A-A
CLAIREMONT DRIVE
NOT TO SCALE



SECTION B-B
BURGENER BLVD
NOT TO SCALE



SECTION C-C
FIELD ST
NOT TO SCALE



SECTION D-D
COWLEY WAY
NOT TO SCALE

CROSS SECTIONS NOTE: SEE SHEET C–6 FOR STREET SECTIONS A–A, B–B, C–C, AND D–D LOCATIONS.

LEGEND

ITEM	SYMBOL
EXISTING BUILDING	
EXISTING WALL	
EXISTING DOMESTIC WATER LINE	W
EXISTING FIRE SERVICE LINE	F
EXISTING SANITARY SEWER	S
EXISTING STORM DRAIN LINE	SD
EXISTING ELECTRICAL LINE	E
EXISTING GAS LINE	G
EXISTING TELECOMMUNICATION LINE	T
EXISTING FIBER OPTIC LINE	F/O
EXISTING CONCRETE PAVEMENT	
EXISTING FIRE HYDRANT	
EXISTING POWER POLE	
EXISTING STREET LIGHT (150W HPS)	
EXISTING CONTOUR	312
EXISTING EASEMENT	
EXISTING TREE	
PROPERTY LINE	P/L
RIGHT–OF–WAY LINE	R/W
PROPOSED EASEMENT	
PROPOSED CONTOUR	312
PROPOSED FIRE SERVICE	FS (F)
PROPOSED WATER LATERAL	W (W)
PROPOSED SEWER LATERAL	S (S)
PEDESTRIAN WALKWAY PATH TO BUS STOP (710')	
DIRECTION OF DRAINAGE FLOW	
VISIBILITY TRIANGLES 10'X10'	
PROPOSED DRIVEWAY PER SGD–163	
PROPOSED BUS STOP SLAB PER SDG–102	
PROPOSED 150 WATT HPS STREET LIGHT	
PROPOSED BACKFLOW PREVENTER	
PROPOSED FIRE DEPARTMENT CONNECTION (FDC)	

STORM WATER NOTE:

THE PROPOSED PROJECT WILL COMPLY WITH ALL THE REQUIREMENTS OF THE CURRENT CITY OF SAN DIEGO STORM WATER STANDARDS MANUAL BEFORE A GRADING OR BUILDING PERMIT IS ISSUED. IT IS THE RESPONSIBILITY OF THE OWNER/DESIGNER/APPLICANT TO ENSURE THAT THE CURRENT STORM WATER PERMANENT BMP DESIGN STANDARDS ARE INCORPORATED INTO THE PROJECT.

PREPARED BY:
NOVA Engineering
4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123
(619) 296-1010

ENGINEER OF WORK/ APPLICANT
NOVA ENGINEERING
4373 VIEWRIDGE AVENUE
SAN DIEGO, CA. 92123 PHONE: (619)–296–1010

MELLOR R. LANDY
R.C.E. 81085

REGISTERED PROFESSIONAL ENGINEER MELLOR R. LANDY No. 81085 Exp. 09–30–23 CIVIL STATE OF CALIFORNIA

ARCHITECT:
AO ARCHITECTS
144 NORTH ORANGE STREET
ORANGE, CA. 92866
PHONE: (714)–639–9860

OWNER:
CLAIREMONT VILLAGE QUAD, LLC
12625 HIGH BLUFF DRIVE, SUITE 310
SAN DIEGO, CA 92130
PHONE: (858)–481–3081

BRUCE KLEEGE

PROJECT NAME: CLAIREMONT VILLAGE
SHEET TITLE: COVER
DATE PREPARED: MAY 3, 2022

NO.	DATE	REVISION
1	09/15/2021	1ST SUBMITTAL
2	05/03/2022	REVISION 1
3		

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

PRELIMINARY
DRAINAGE REPORT FOR
CLAIREMONT VILLAGE
3007 Clairemont Drive
For the City of San Diego

April 20, 2022

Mellor Landy, PE - Lic. No# 81085

TABLE OF CONTENTS

OBJECTIVE

This preliminary drainage report will show how the impacts of post-development flows will remain approximately the same as pre-development flows. Additionally, flows will not be diverted and will confluence at the same point during post development condition.

ASSUMPTIONS

This drainage report assumes the site is underlain by soil type D per the City of San Diego Drainage Design Manual, January 2017 Edition (Note 1 below Table A-1) and will have low permeability into the site's underlying soils. The project site is currently fully developed land covered by primarily impervious areas such as a long concrete driveway, concrete walkways, AC parking lots, and rooftops for existing structures. The Post-development condition will create a 224 multi-unit apartment community development located within the southern corner of the property, directly adjacent to Field Street and Cowley Way. Based on Table A-1 on Appendix A, Section A1.2 Runoff Coefficient for Rational Method of the City of San Diego Drainage Design Manual, January 2017 Edition, the proposed development area runoff coefficient corresponds to a C value of 0.70 for "Multi Units". Based on the existing land use type consisting of commercial buildings and parking lots servicing the existing commercial structures, the pre-project areas and undisturbed areas of the site in post development conditions shall correspond to a C value of 0.85 for "Commercial" land use type per Table A-1 from the City's Drainage Design Manual. Commercial area runoff coefficient's will be adjusted based on actual vs. tabulated % imperviousness as outlined under Table A-1 in the city's manual.

INTRODUCTION

This drainage report shall serve to depict existing and proposed drainage patterns for the Clairemont Village project located at 3007 Clairemont Drive which is located directly northwest of the intersection of Field Street and Cowley Way. The proposed development portion of the project site is bound to the northwest by Sprouts' grocery store and other existing shops that make up the existing shopping mall within the property boundary, bound to the north by Rite-Aid, bound to the east by Cowley Way, and bound to the south by Field Street.

The project is not required to obtain approval from the Regional Water Quality Control Board (SWRCB) Under Federal Clean Water Act (CWA) Section 401 or 404. The project does no propose to discharge fill and dredged material to waters of the State, including waters of the U.S.

EXISTING DRAINAGE PATTERN

The onsite overland drainage to be analyzed for the proposed development is part of a bigger drainage area, which consists of several subareas such as: rooftops and partial rooftop footprints of the existing structures to the north and northwest, a portion of the AC parking lot on the west side of these structures that routes to an existing drainage inlet located in front of Sprouts (which ties back into the existing underground storm drain system routing southerly to the project's point of compliance), the existing concrete driveway located behind sprouts, the entire larger existing AC paved parking lot at the east side of the property boundary where the proposed apartment complex will be located, and the existing landscaped slope located along the Northeasterly property line. The general drainage pattern of the site can be simplified into two main directions of flow. The westerly drainage subareas either sheet flow or pipe flow easterly into a series of existing surface level drainage inlets located from North to South along the existing larger easterly AC parking lot. The easterly portions of the drainage subareas located along Cowley Way and the northeasterly property line sheet flow westerly to the same series of existing surface level drainage inlets located from North to South along the existing larger easterly AC parking lot. The entire tributary drainage area for this project flows southerly to the existing curb inlet located at the southerly corner of the existing AC paved parking lot. This existing curb inlet is located directly adjacent to the northwest curb return of the intersection of Field Street and Cowley Way. Flows are routed to this existing curb inlet via surface drainage as well as existing underground storm drain piping. This existing curb inlet location acts as the point of confluence for this project and will be utilized to compare post -development flows to pre-development flows. The westerly portion of the site however, the portion that is unaffected by the proposed development, sheet flows westerly to another Point of Compliance located at the corner of Burgener Blvd and Clairemont Drive. As this westerly draining portion of the site lies within the overall property boundary, it has also been analyzed within this report for pre-development and post development flows to ensure there is no net increase in flow leaving the site on this half of the development as well.

PROPOSED DRAINAGE PATTERN

Under post development conditions, the westerly drainage existing subareas either sheet flow or pipe flow easterly via a series of roof drains or existing surface level drainage inlets and existing storm drain piping. The westerly drainage will be picked up by a proposed length of underground storm drain piping that runs from the northerly corner of the site in front of rite-aid, to the northerly end of the existing concrete driveway at the central portion of the site. At this location, the proposed storm drain pipe run will tie into an existing preserved drainage inlet and then runoff will continue out to the the ultimate discharge point/point of confluence for the site at the corner of Cowley Way and Field Street via existing 24″ storm drain pipes. The main difference in drainage pattern under post development conditions, is runoff that is collected on the rooftops of the proposed structure being constructed in the rear AC parking lot, will now be diverted and routed into a series of biofiltration planters located along the sides of the building. These planters will treat the runoff, and discharge the stormwater collected from the proposed building northerly via a proposed discharge pipe. This pipe will route the stormwater captured from the structure footprint into a hydromodification storage vault located beneath the AC surface at the northerly corner of the site as shown on the post-development hydrology map. Runoff captured from the easterly most corner of the site will also differ slightly in post development conditions. The runoff in this area will be captured along the fire accessible entrance road adjacent to the structure and will be routed along a proposed curb northerly. This runoff will empty into a proposed drainage inlet connected to a proposed modular wetland system. The MWS will treat the runoff and then discharge the runoff to the same northerly hydromodification storage vault. Once runoff is detained from both this tributary area and the larger tributary area of the proposed structure's footprint, the storage vault will discharge the runoff at controlled rates via an 18″ proposed storm drain outlet pipe that will route southwesterly, parallel to the other proposed storm drain that is picking up all the runoff from the existing westerly portions of the site. These two proposed storm drains will tie together at a proposed inlet and the combined flow will route into one more reach of proposed 18″ pipe. This last reach of proposed piping ties into the existing preserved drainage inlet previously mentioned and runoff is then carried off to the ultimate discharge point/point of confluence located at the existing curb inlet at the southerly corner of the project site. Due to the increase in overall stormwater flow length to the point of compliance as discussed above, there will be an increase in Time of Concentration. However, the general overall drainage pattern will be preserved under post development conditions.

HYDROLOGIC METHOD OF ANALYSES

This study contains 100-year hydrologic analyses to determine the existing and proposed flows generated by the project. The City of San Diego Drainage Design Manual, Jan. 2017 edition criteria along with the City of San Diego Rational Method was utilized in calculating runoff flows. This report utilizes AES, advanced engineering software, which incorporates the rational method to determine 100-year peak flows at all nodes of the entire drainage basin under both pre and post development conditions. Please see below for the City of San Diego's Drainage Design Manual's detailed description of the rational method procedure.

Rational Method and Modified Rational Method

A.1. Rational Method (RM)

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and drainage structures. The RM is recommended for analyzing the runoff response from drainage areas for watersheds less than 0.5 square miles. It should not be used in instances where there is a junction of independent drainage systems or for drainage areas greater than approximately 0.5 square mile in size. In these instances, the Modified Rational Method (MRM) should be used for junctions of independent drainage systems in watersheds up to approximately 1 square mile in size (see Section A.2); or the NRCS Hydrologic Method should be used for watersheds greater than approximately 1 square mile in size (see Appendix B).

A1.1. Rational Method Formula

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (T_c), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed in Equation A-1.

Equation A-1. RM Formula Expression

$$Q = C\ I\ A$$

where:

Q	=	peak discharge, in cubic feet per second (cfs)
C	=	runoff coefficient expressed as that percentage of rainfall which becomes surface runoff (no units); Refer to Appendix A.1.2
I	=	average rainfall intensity for a storm duration equal to the time of concentration (T_c) of the contributing drainage area, in inches per hour; Refer to Appendix A.1.3 and Appendix A.1.4
A	=	drainage area contributing to the design location, in acres

Combining the units for the expression CIA yields:

For

$$\left(\frac{1\text{ acre}\times\text{inch}}{\text{hour}}\right)\left(\frac{43{,}560\text{ ft}^2}{\text{acre}}\right)\left(\frac{1\text{ foot}}{12\text{ inches}}\right)\left(\frac{1\text{ hour}}{3{,}600\text{ seconds}}\right)\Rightarrow 1.008\text{ cfs}$$

practical purposes, the unit conversion coefficient difference of 0.8% can be ignored.

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

Unlike the MRM (discussed in Appendix A.2) or the NRCS hydrologic method (discussed in Appendix B), the RM does not create hydrographs and therefore does not add separate subarea hydrographs at collection points. Instead, the RM develops peak discharges in the main line by increasing the T_c as flow travels downstream.

Characteristics of, or assumptions inherent to, the RM are listed below:

1. The discharge resulting from any I is maximum when the I lasts as long as or longer than the T_c.
2. The storm frequency of peak discharges is the same as that of I for the given T_c.
3. The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in the NRCS method).
4. The peak rate of runoff is the only information produced by using the RM.

A.1.2. Runoff Coefficient

The runoff coefficients are based on land use (see Table A–1). Soil type "D" is used throughout the City of San Diego for storm drain conveyance design. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient (Σ[CA]). Good engineering judgment should be used when applying the values presented in Table A–1, as adjustments to these values may be appropriate based on site-specific characteristics.

Table A-1. Runoff Coefficients for Rational Method

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi–Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness	=	50%
Tabulated imperviousness	=	80%
Revised C = (50/80) x 0.85	=	0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

CONCLUSION

The table below summarizes the existing Q100 flow vs. the proposed Q100 flow. The design of the proposed drainage systems precautions were taken to limit adverse downstream affects and to maintain existing drainage characteristics. Therefore, the Q100 for the project will just slightly decrease from 18.27 cfs in pre-development to 18.24 cfs during Post-Development conditions. Also, as anticipated, the flow to the second POC (node 500) was not altered from pre project to post project conditions. No increase in runoff was generated on this side of the project site either. The project has no increase in peak flows in the unmitigated 100-year storm condition, however onsite biofiltration planters, a modular wetland system, and an underground storage vault will further detain runoff onsite to adhere to water quality and hydromodification requirements.

PEAK Q-100 FLOWS

	C (avg)	**Tc Min**	**I In/hr**	**A (ac)**	**Q_{100} cfs**
Pre-Development					
Node 130	0.79	7.2	3.915	5.9	18.27
Post-Development					
Node 130	0.83	9.95	3.718	5.9	18.24
Net Increase					-.03
Pre-Development					
Node 500	0.85	8.9	3.99	6.6	22.47
Post-Development					
Node 500	0.85	8.9	3.99	6.6	22.47
Net Increase					.00

- The project will not alter the overall drainage patterns on the site.
- The ultimate discharge point for the project will not be changed
- Graded areas and slopes will be landscaped to reduce or eliminate sediment discharge.
- Construction and post-construction BMPs will address mitigation measures to protect water quality and protection of water quality objectives and beneficial uses to the maximum extent practicable.
- The storm drain system for the project is designed to route and convey all resulting runoff from developed conditions to the existing point of discharge.

APPENDIX A

AES CALCULATIONS

PRE-DEVELOPMENT

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2007 Advanced Engineering Software (aes)
             Ver. 13.9 Release Date: 04/04/2008  License ID 1402

                          Analysis prepared by:

                            Stuart Engineering
                    7525 Metropolitan Drive, Suite 308
                       San Diego, California 92108
                  (619) 296-1010  se@stuartengineering.com

 ************************** DESCRIPTION OF STUDY **************************
* 1239 PROPOSED CONDITIONS - 100 YEAR STORM                                *
*                                                                          *
*                                                                          *
 **************************************************************************

  FILE NAME: 1239P100.DAT
  TIME/DATE OF STUDY: 09:27 09/22/2016
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  7
   1)   5.000;  4.400
   2)  10.000;  3.300
   3)  15.000;  2.900
   4)  30.000;  2.000
   5)  45.000;  1.550
   6)  60.000;  1.300
   7) 600.000;  0.330
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      1.23
  TOTAL AREA(ACRES) =      0.33   TOTAL RUNOFF(CFS) =      1.23

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.36   SUBAREA RUNOFF(CFS) =    0.87
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =      2.11
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   301.58  DOWNSTREAM(FEET) =   299.78
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.65
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.11
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    5.53
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     20.00 =    180.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.283
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.60   SUBAREA RUNOFF(CFS) =    2.08
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =      4.19
  TC(MIN.) =    5.53

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   299.78  DOWNSTREAM(FEET) =   298.70
  FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.52
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.19
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    5.81
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =    288.00 FEET.

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

```
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.223
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    1.12   SUBAREA RUNOFF(CFS) =    4.02
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =       8.21
  TC(MIN.) =    5.81

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   298.20  DOWNSTREAM(FEET) =   297.35
  FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.44
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.21
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    6.03
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =     373.00 FEET.

+--------------------------------------------------------------------------+
| The slope of the exist. 10" SD has been calculated to be ~1.0.           |
| AES has been used to calculate the capacity of a 10" SD with a slope     |
| of 1.0%. 0.50 CFS have been added as a safety. Q 10" SD = ~3.45 CFS      |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =     3.45(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =     1.51(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =     3.45  AREA(AC.) =     1.51
  * SUMMED DATA: FLOW(CFS) =    11.66    TOTAL AREA(ACRES) =     3.92

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   297.35  DOWNSTREAM(FEET) =   293.98
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.66
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =    6.57
  * TOTAL SOURCE FLOW(CFS) =       3.45
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     623.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

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

**************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  22
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      1.08
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      1.08

**************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   297.33  DOWNSTREAM(FEET) =   296.57
  FLOW LENGTH(FEET) =    32.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.35
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.08
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     70.00 =      49.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   296.57  DOWNSTREAM(FEET) =   295.61
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.40
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.19
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     80.00 =      89.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  10
--------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
==========================================================================

**************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     90.00 IS CODE =  22
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  SUBAREA RUNOFF(CFS) =      0.71
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.71
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   299.00  DOWNSTREAM(FEET) =   298.68
  FLOW LENGTH(FEET) =    16.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.56
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        0.71
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.05
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =      56.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 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        0.71     5.05       4.389        0.19
  LONGEST FLOWPATH FROM NODE     90.00 TO NODE     80.00 =      56.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.08     5.19       4.359        0.29
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     80.00 =      89.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       1.79       5.05        4.389
      2       1.79       5.19        4.359

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.79   Tc(MIN.) =    5.19
  TOTAL AREA(ACRES) =        0.5

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     95.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   295.61  DOWNSTREAM(FEET) =   294.89
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.52
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.79
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    5.25
```

```
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     95.00 =     119.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     95.00 TO NODE     95.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  22
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 USER SPECIFIED Tc(MIN.) =    5.000
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
 SUBAREA RUNOFF(CFS) =      0.19
 TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE     95.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   298.00  DOWNSTREAM(FEET) =   296.39
 FLOW LENGTH(FEET) =   109.00   MANNING'S N =  0.010
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.45
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.19
 PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    5.53
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE     95.00 =     125.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     95.00 TO NODE     95.00 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        0.19     5.53       4.284        0.05
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE     95.00 =     125.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        1.79     5.25       4.344        0.48
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     95.00 =     119.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       1.97       5.25        4.344
     2       1.95       5.53        4.284

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       1.97   Tc(MIN.) =    5.25
 TOTAL AREA(ACRES) =        0.5
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     95.00 TO NODE     95.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     95.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   294.89  DOWNSTREAM(FEET) =   294.48
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.72
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.97
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.29
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE     50.00 =     142.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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        1.97     5.29       4.336        0.53
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE     50.00 =     142.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA     SOURCE
  NUMBER      (CFS)   ( MIN.)   (INCH/HOUR)   (ACRE)     FLOW
     1        8.21     6.57       4.055        2.41      3.45
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     50.00 =     623.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       9.65       5.29        4.336
     2      10.05       6.57        4.055

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.05   Tc(MIN.) =    6.57
  TOTAL AREA(ACRES) =        2.9

  * SOURCE FLOW DATA: FLOW(CFS) =       3.45     AREA(ACRES) =        1.5
  * SUMMED DATA: FLOW(CFS) =      13.50    TOTAL AREA(ACRES) =        4.4

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   293.48  DOWNSTREAM(FEET) =   292.97
  FLOW LENGTH(FEET) =    79.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.21
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.50
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    6.78
  * TOTAL SOURCE FLOW(CFS) =       3.45
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =     702.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   292.97  DOWNSTREAM(FEET) =   292.73
  FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.22
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.50
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    6.88
  * TOTAL SOURCE FLOW(CFS) =       3.45
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    120.00 =     739.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   292.73  DOWNSTREAM(FEET) =   291.94
  FLOW LENGTH(FEET) =   121.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.24
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.50
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    7.20
  * TOTAL SOURCE FLOW(CFS) =       3.45
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     860.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    150.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    309.00
  DOWNSTREAM ELEVATION(FEET) =    307.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.966
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.610
SUBAREA RUNOFF(CFS) =      0.16
TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
FLOW PROCESS FROM NODE    150.00 TO NODE    130.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    308.00  DOWNSTREAM(FEET) =    294.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   461.00   CHANNEL SLOPE =  0.0304
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   0.000
MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.25
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.384
*USER SPECIFIED(SUBAREA):
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.68
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.65
AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.11
Tc(MIN.) =    5.07
SUBAREA AREA(ACRES) =     1.39       SUBAREA RUNOFF(CFS) =    5.18
TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       5.33

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   4.55
LONGEST FLOWPATH FROM NODE    140.00 TO NODE    130.00 =     541.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 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        5.33     5.07       4.384        1.46
LONGEST FLOWPATH FROM NODE    140.00 TO NODE    130.00 =     541.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA     SOURCE
NUMBER      (CFS)   ( MIN.)   (INCH/HOUR)   (ACRE)     FLOW
    1       10.05     7.20       3.915        2.94      3.45
LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =     860.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc      INTENSITY
NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1      14.31       5.07        4.384
    2      14.82       7.20        3.915

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      14.82   Tc(MIN.) =    7.20
TOTAL AREA(ACRES) =        4.4

* SOURCE FLOW DATA: FLOW(CFS) =       3.45     AREA(ACRES) =        1.5
* SUMMED DATA: FLOW(CFS) =      18.27    TOTAL AREA(ACRES) =        5.9

****************************************************************************
FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        4.4  TC(MIN.) =      7.20
  PEAK FLOW RATE(CFS)    =      14.82
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =       3.45  AREA(AC.) =        1.5
  * SUMMED DATA: FLOW(CFS) =      18.27    TOTAL AREA(ACRES) =        5.9
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

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

              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
              Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                       2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2012 Advanced Engineering Software (aes)
             Ver. 19.0 Release Date: 06/01/2012  License ID 1503

                            Analysis prepared by:

                             LANDMARK CONSULTING
                         9555 GENESEE AVE. SUITE 200
                             SAN DIEGO, CA 92121
                    TEL:  858-587-8070, FAX:  858-587-8750

 ************************** DESCRIPTION OF STUDY **************************
 * 325-17 CLAIREMONT VILLAGE                                              *
 * WESTERLY POC 2 ANALYSIS                                                *
 * DOES NOT CONFLUENCE WITH PROJECT SITE                                  *
 **************************************************************************

                          FILE NAME: 325E100.DAT
                    TIME/DATE OF STUDY: 16:50 04/20/2022
----------------------------------------------------------------------------
         USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
                       2003 SAN DIEGO MANUAL CRITERIA

                USER SPECIFIED STORM EVENT(YEAR) = 100.00
            6-HOUR DURATION PRECIPITATION (INCHES) =   2.200
               SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
       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   10.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

                  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 = 10.0 (FT*FT/S)
                 *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
                  OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
      FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  22
----------------------------------------------------------------------------
              >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                        *USER SPECIFIED(SUBAREA):
                 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                    S.C.S. CURVE NUMBER (AMC II) =   0
                    USER SPECIFIED Tc(MIN.) =    5.000
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                       SUBAREA RUNOFF(CFS) =     0.25
```

```
TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    298.94  DOWNSTREAM(FEET) =    296.75
CHANNEL LENGTH THRU SUBAREA(FEET) =   146.00   CHANNEL SLOPE =  0.0150
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.773
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.38
AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.76
Tc(MIN.) =    6.76
SUBAREA AREA(ACRES) =     0.16       SUBAREA RUNOFF(CFS) =    0.65
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =       0.2        PEAK FLOW RATE(CFS) =       0.86

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.65
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     146.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.773
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    1.00
TOTAL AREA(ACRES) =       0.5   TOTAL RUNOFF(CFS) =      1.86
TC(MIN.) =    6.76

****************************************************************************
FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 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.) =    6.76
RAINFALL INTENSITY(INCH/HR) =   4.77
TOTAL STREAM AREA(ACRES) =     0.46
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.86

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  22
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
```

```
            USER-SPECIFIED RUNOFF COEFFICIENT = .8500
               S.C.S. CURVE NUMBER (AMC II) =   0
               USER SPECIFIED Tc(MIN.) =    5.000
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                  SUBAREA RUNOFF(CFS) =      0.27
 TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     30.00 IS CODE =  51
----------------------------------------------------------------------------
          >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
        >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.66  DOWNSTREAM(FEET) =    302.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   232.00   CHANNEL SLOPE =  0.0072
          CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
         MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
       100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.332
                    *USER SPECIFIED(SUBAREA):
            USER-SPECIFIED RUNOFF COEFFICIENT = .8500
               S.C.S. CURVE NUMBER (AMC II) =   0
      TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
     TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
     AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.85
                      Tc(MIN.) =    7.85
    SUBAREA AREA(ACRES) =     0.39      SUBAREA RUNOFF(CFS) =    1.44
            AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =       0.4        PEAK FLOW RATE(CFS) =       1.64

              END OF SUBAREA CHANNEL FLOW HYDRAULICS:
         DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.66
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     30.00 =     378.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
          >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
         >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
                 TOTAL NUMBER OF STREAMS =  2
        CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
               TIME OF CONCENTRATION(MIN.) =    7.85
               RAINFALL INTENSITY(INCH/HR) =   4.33
                TOTAL STREAM AREA(ACRES) =     0.45
           PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.64

                     ** CONFLUENCE DATA **
         STREAM     RUNOFF      Tc      INTENSITY      AREA
         NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
          1         1.86     6.76        4.773         0.46
          2         1.64     7.85        4.332         0.45

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

                   ** PEAK FLOW RATE TABLE **
              STREAM     RUNOFF      Tc     INTENSITY
              NUMBER      (CFS)    (MIN.)  (INCH/HOUR)
                 1        3.27     6.76       4.773
                 2        3.33     7.85       4.332
```

```
          COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
      PEAK FLOW RATE(CFS) =       3.33   Tc(MIN.) =    7.85
                TOTAL AREA(ACRES) =        0.9
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     30.00 =     378.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
 ----------------------------------------------------------------------------
      >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
            >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  302.00  DOWNSTREAM ELEVATION(FEET) =  293.00
      STREET LENGTH(FEET) =   309.00   CURB HEIGHT(INCHES) =  6.0
                STREET HALFWIDTH(FEET) = 10.00

       DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
           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) =   0.0130
    Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.35
        STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
               STREET FLOW DEPTH(FEET) =  0.29
            HALFSTREET FLOOD WIDTH(FEET) =    8.40
          AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.06
        PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.20
      STREET FLOW TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    9.12
        100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.934
                   *USER SPECIFIED(SUBAREA):
           USER-SPECIFIED RUNOFF COEFFICIENT = .8500
              S.C.S. CURVE NUMBER (AMC II) =   0
            AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
   SUBAREA AREA(ACRES) =    0.01      SUBAREA RUNOFF(CFS) =    0.04
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.33

            END OF SUBAREA STREET FLOW HYDRAULICS:
       DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.40
  FLOW VELOCITY(FEET/SEC.) =  4.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     687.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  10
 ----------------------------------------------------------------------------
       >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
   FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  22
 ----------------------------------------------------------------------------
         >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                   *USER SPECIFIED(SUBAREA):
           USER-SPECIFIED RUNOFF COEFFICIENT = .8500
              S.C.S. CURVE NUMBER (AMC II) =   0
              USER SPECIFIED Tc(MIN.) =    5.000
```

```
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                    SUBAREA RUNOFF(CFS) =      0.28
     TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
   FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
                >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
           >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    300.61
   CHANNEL LENGTH THRU SUBAREA(FEET) =   139.00   CHANNEL SLOPE =  0.0237
            CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
         MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.051
                        *USER SPECIFIED(SUBAREA):
                USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                    S.C.S. CURVE NUMBER (AMC II) =   0
      TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.85
     TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.95
     AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.19
                           Tc(MIN.) =    6.19
    SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =    1.15
                AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =       0.3        PEAK FLOW RATE(CFS) =      1.40

                 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
         DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.33
 LONGEST FLOWPATH FROM NODE     70.00 TO NODE     90.00 =     448.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE     90.00 TO NODE     90.10 IS CODE =  91
----------------------------------------------------------------------------
      >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
                UPSTREAM NODE ELEVATION(FEET) =    300.61
               DOWNSTREAM NODE ELEVATION(FEET) =    293.66
              CHANNEL LENGTH THRU SUBAREA(FEET) =   166.00
      "V" GUTTER WIDTH(FEET) =   1.50   GUTTER HIKE(FEET) =  0.250
           PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
            PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
                      MAXIMUM DEPTH(FEET) =   1.00
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.845
                        *USER SPECIFIED(SUBAREA):
                USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                    S.C.S. CURVE NUMBER (AMC II) =   0
      TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.42
     TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.69
    AVERAGE FLOW DEPTH(FEET) =   0.35   FLOOD WIDTH(FEET) =    1.50
    "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.41   Tc(MIN.) =    6.60
    SUBAREA AREA(ACRES) =    0.01       SUBAREA RUNOFF(CFS) =    0.04
                AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =       0.3        PEAK FLOW RATE(CFS) =      1.40

                NOTE:TRAVEL TIME ESTIMATES BASED ON NORMAL
               DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]

                  END OF SUBAREA "V" GUTTER HYDRAULICS:
           DEPTH(FEET) =  0.35   FLOOD WIDTH(FEET) =    1.50
   FLOW VELOCITY(FEET/SEC.) =   6.69   DEPTH*VELOCITY(FT*FT/SEC) =   2.34
```

```
 LONGEST FLOWPATH FROM NODE     70.00 TO NODE     90.10 =    614.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE     90.10 TO NODE     90.10 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.) =    6.60
                   RAINFALL INTENSITY(INCH/HR) =   4.84
                   TOTAL STREAM AREA(ACRES) =     0.34
               PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.40

****************************************************************************
      FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  22
----------------------------------------------------------------------------
            >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                      *USER SPECIFIED(SUBAREA):
                USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                   S.C.S. CURVE NUMBER (AMC II) =   0
                   USER SPECIFIED Tc(MIN.) =    5.000
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                    SUBAREA RUNOFF(CFS) =      0.37
       TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
      FLOW PROCESS FROM NODE    110.00 TO NODE     90.10 IS CODE =  51
----------------------------------------------------------------------------
                 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
            >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    293.66
   CHANNEL LENGTH THRU SUBAREA(FEET) =   252.00   CHANNEL SLOPE =  0.0406
            CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
          MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.853
                      *USER SPECIFIED(SUBAREA):
                USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                   S.C.S. CURVE NUMBER (AMC II) =   0
         TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.37
       TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.65
       AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.59
                          Tc(MIN.) =    6.59
     SUBAREA AREA(ACRES) =     0.49       SUBAREA RUNOFF(CFS) =    2.00
                 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.31

                  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
          DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE     90.10 =    418.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE     90.10 TO NODE     90.10 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.) = 6.59
RAINFALL INTENSITY(INCH/HR) = 4.85
TOTAL STREAM AREA(ACRES) = 0.56
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.31

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	1.40	6.60	4.845	0.34
2	2.31	6.59	4.853	0.56

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	3.70	6.59	4.853
2	3.70	6.60	4.845

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 3.70 Tc(MIN.) = 6.59
TOTAL AREA(ACRES) = 0.9
LONGEST FLOWPATH FROM NODE 70.00 TO NODE 90.10 = 614.00 FEET.

****
FLOW PROCESS FROM NODE 90.10 TO NODE 60.00 IS CODE = 91

>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==
UPSTREAM NODE ELEVATION(FEET) = 293.66
DOWNSTREAM NODE ELEVATION(FEET) = 293.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 10.00
"V" GUTTER WIDTH(FEET) = 1.50 GUTTER HIKE(FEET) = 0.250
PAVEMENT LIP(FEET) = 0.100 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.844
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.72
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 8.28
AVERAGE FLOW DEPTH(FEET) = 0.38 FLOOD WIDTH(FEET) = 4.96
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 6.61
SUBAREA AREA(ACRES) = 0.01 SUBAREA RUNOFF(CFS) = 0.04
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 3.73

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.39 FLOOD WIDTH(FEET) = 5.13
FLOW VELOCITY(FEET/SEC.) = 8.14 DEPTH*VELOCITY(FT*FT/SEC) = 3.14
LONGEST FLOWPATH FROM NODE 70.00 TO NODE 60.00 = 624.00 FEET.

****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 10

>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
==

```
****************************************************************************
FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  22
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
USER SPECIFIED Tc(MIN.) =    5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
SUBAREA RUNOFF(CFS) =     0.49
TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
FLOW PROCESS FROM NODE    130.00 TO NODE     60.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    297.42  DOWNSTREAM(FEET) =    293.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00   CHANNEL SLOPE =  0.0295
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.018
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.83
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.99
AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.25
Tc(MIN.) =    6.25
SUBAREA AREA(ACRES) =     0.16       SUBAREA RUNOFF(CFS) =    0.68
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.11

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   2.23
LONGEST FLOWPATH FROM NODE    120.00 TO NODE     60.00 =     160.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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        1.11     6.25       5.018        0.26
LONGEST FLOWPATH FROM NODE    120.00 TO NODE     60.00 =     160.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
  1        3.33     9.12       3.934        0.91
LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     687.00 FEET.

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

NUMBER	(CFS)	(MIN.)	(INCH/HOUR)
1	3.39	6.25	5.018
2	4.20	9.12	3.934

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 4.20 Tc(MIN.) = 9.12
TOTAL AREA(ACRES) = 1.2

****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 12

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

****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 11

>>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
==

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	4.20	9.12	3.934	1.17

LONGEST FLOWPATH FROM NODE 40.00 TO NODE 60.00 = 687.00 FEET.

** MEMORY BANK # 2 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	3.73	6.61	4.844	0.90

LONGEST FLOWPATH FROM NODE 70.00 TO NODE 60.00 = 624.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	6.77	6.61	4.844
2	7.22	9.12	3.934

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 7.22 Tc(MIN.) = 9.12
TOTAL AREA(ACRES) = 2.1

****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 12

>>>>>CLEAR MEMORY BANK # 2 <<<<<
==

****
FLOW PROCESS FROM NODE 60.00 TO NODE 140.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 1 USED)<<<<<
==
UPSTREAM ELEVATION(FEET) = 293.00 DOWNSTREAM ELEVATION(FEET) = 291.87
STREET LENGTH(FEET) = 158.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 10.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
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) =   0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.24
***STREET FLOWING FULL***
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) =  0.36
HALFSTREET FLOOD WIDTH(FEET) =   10.00
AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.55
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.91
STREET FLOW TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =   10.15
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.671
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
SUBAREA AREA(ACRES) =    0.01      SUBAREA RUNOFF(CFS) =    0.03
TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =       7.22

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.00
FLOW VELOCITY(FEET/SEC.) =  2.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.91
LONGEST FLOWPATH FROM NODE     40.00 TO NODE    140.00 =     845.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 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.) =   10.15
RAINFALL INTENSITY(INCH/HR) =   3.67
TOTAL STREAM AREA(ACRES) =     2.09
PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.22

****************************************************************************
FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  22
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
USER SPECIFIED Tc(MIN.) =    5.000
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
SUBAREA RUNOFF(CFS) =      0.49
TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
FLOW PROCESS FROM NODE    160.00 TO NODE    140.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    294.85  DOWNSTREAM(FEET) =    291.87
```

CHANNEL LENGTH THRU SUBAREA(FEET) = 115.00 CHANNEL SLOPE = 0.0259
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.161
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.81
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.94
AVERAGE FLOW DEPTH(FEET) = 0.04 TRAVEL TIME(MIN.) = 0.99
Tc(MIN.) = 5.99
SUBAREA AREA(ACRES) = 0.15 SUBAREA RUNOFF(CFS) = 0.64
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
TOTAL AREA(ACRES) = 0.2 PEAK FLOW RATE(CFS) = 1.08

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.05 FLOW VELOCITY(FEET/SEC.) = 2.08
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 140.00 = 15915.00 FEET.

****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.99
RAINFALL INTENSITY(INCH/HR) = 5.16
TOTAL STREAM AREA(ACRES) = 0.25
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.08

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	7.22	10.15	3.671	2.09
2	1.08	5.99	5.161	0.25

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	5.34	5.99	5.161
2	7.99	10.15	3.671

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 7.99 Tc(MIN.) = 10.15
TOTAL AREA(ACRES) = 2.3
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 140.00 = 15915.00 FEET.

****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.671
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500

```
                S.C.S. CURVE NUMBER (AMC II) =   0
             AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
   SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.60
  TOTAL AREA(ACRES) =       2.5   TOTAL RUNOFF(CFS) =       7.99
                      TC(MIN.) =   10.15
         NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
   FLOW PROCESS FROM NODE    140.00 TO NODE    500.00 IS CODE =  62
----------------------------------------------------------------------------
      >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
            >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  291.87  DOWNSTREAM ELEVATION(FEET) =  291.00
        STREET LENGTH(FEET) =    56.00   CURB HEIGHT(INCHES) =  6.0
                   STREET HALFWIDTH(FEET) = 10.00

      DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
               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) =   0.0130
    Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.01
                      ***STREET FLOWING FULL***
             STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
                    STREET FLOW DEPTH(FEET) =  0.33
                 HALFSTREET FLOOD WIDTH(FEET) =   10.00
               AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.38
            PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
        STREET FLOW TRAVEL TIME(MIN.) =   0.28   Tc(MIN.) =   10.43
            100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.608
                      *USER SPECIFIED(SUBAREA):
               USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                S.C.S. CURVE NUMBER (AMC II) =   0
             AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    0.01      SUBAREA RUNOFF(CFS) =    0.03
 TOTAL AREA(ACRES) =       2.5       PEAK FLOW RATE(CFS) =       7.99

                END OF SUBAREA STREET FLOW HYDRAULICS:
      DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.00
  FLOW VELOCITY(FEET/SEC.) =  3.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    500.00 =   15971.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  10
----------------------------------------------------------------------------
      >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
   FLOW PROCESS FROM NODE    170.00 TO NODE    180.00 IS CODE =  22
----------------------------------------------------------------------------
         >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                      *USER SPECIFIED(SUBAREA):
               USER-SPECIFIED RUNOFF COEFFICIENT = .8500
```

```
                S.C.S. CURVE NUMBER (AMC II) =   0
                USER SPECIFIED Tc(MIN.) =    5.000
        100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                 SUBAREA RUNOFF(CFS) =     0.49
   TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
   FLOW PROCESS FROM NODE    180.00 TO NODE    500.00 IS CODE =  51
----------------------------------------------------------------------------
           >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
      >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    291.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   345.00   CHANNEL SLOPE =  0.0374
       CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
     MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
        100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.708
                  *USER SPECIFIED(SUBAREA):
            USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                S.C.S. CURVE NUMBER (AMC II) =   0
    TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.81
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.02
   AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.90
                      Tc(MIN.) =    6.90
  SUBAREA AREA(ACRES) =     0.65      SUBAREA RUNOFF(CFS) =    2.62
            AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 TOTAL AREA(ACRES) =       0.8        PEAK FLOW RATE(CFS) =       3.02

            END OF SUBAREA CHANNEL FLOW HYDRAULICS:
     DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.58
 LONGEST FLOWPATH FROM NODE    170.00 TO NODE    500.00 =     401.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  10
----------------------------------------------------------------------------
    >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
   FLOW PROCESS FROM NODE    190.00 TO NODE    200.00 IS CODE =  22
----------------------------------------------------------------------------
        >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                  *USER SPECIFIED(SUBAREA):
            USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                S.C.S. CURVE NUMBER (AMC II) =   0
                USER SPECIFIED Tc(MIN.) =    5.000
        100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                 SUBAREA RUNOFF(CFS) =     0.72
   TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
   FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  51
----------------------------------------------------------------------------
           >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
      >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    316.00  DOWNSTREAM(FEET) =    304.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   397.00   CHANNEL SLOPE =  0.0302
       CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
```

```
       MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
           100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.851
                      *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
     TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.26
    TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.16
    AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.59
                        Tc(MIN.) =    6.59
   SUBAREA AREA(ACRES) =     2.19       SUBAREA RUNOFF(CFS) =    9.02
               AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.62

               END OF SUBAREA CHANNEL FLOW HYDRAULICS:
       DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   5.13
 LONGEST FLOWPATH FROM NODE    190.00 TO NODE    210.00 =     742.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  91
----------------------------------------------------------------------------
         >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
              UPSTREAM NODE ELEVATION(FEET) =    304.00
               DOWNSTREAM NODE ELEVATION(FEET) =    300.40
               CHANNEL LENGTH THRU SUBAREA(FEET) =   271.00
    "V" GUTTER WIDTH(FEET) =   1.50   GUTTER HIKE(FEET) =  0.250
         PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
             PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
                    MAXIMUM DEPTH(FEET) =   2.00
           100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.299
                      *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
     TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.64
    TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.32
    AVERAGE FLOW DEPTH(FEET) =   0.56   FLOOD WIDTH(FEET) =   22.69
    "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.36   Tc(MIN.) =    7.95
   SUBAREA AREA(ACRES) =    0.01       SUBAREA RUNOFF(CFS) =    0.04
               AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.62

                END OF SUBAREA "V" GUTTER HYDRAULICS:
         DEPTH(FEET) =  0.56   FLOOD WIDTH(FEET) =   22.69
  FLOW VELOCITY(FEET/SEC.) =   3.32   DEPTH*VELOCITY(FT*FT/SEC) =   1.86
 LONGEST FLOWPATH FROM NODE    190.00 TO NODE    220.00 =    1013.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
          >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
                    TOTAL NUMBER OF STREAMS =  2
          CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
                TIME OF CONCENTRATION(MIN.) =    7.95
                 RAINFALL INTENSITY(INCH/HR) =   4.30
                  TOTAL STREAM AREA(ACRES) =     2.34
            PEAK FLOW RATE(CFS) AT CONFLUENCE =     9.62

****************************************************************************
      FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  22
```

```
----------------------------------------------------------------------------
            >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                        *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
                 USER SPECIFIED Tc(MIN.) =    5.000
          100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                  SUBAREA RUNOFF(CFS) =      0.49
     TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
     FLOW PROCESS FROM NODE    240.00 TO NODE    220.00 IS CODE =  51
----------------------------------------------------------------------------
              >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
          >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    300.40
   CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0167
          CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
        MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
          100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.790
                        *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
      TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.22
     TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
     AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.72
                           Tc(MIN.) =    6.72
    SUBAREA AREA(ACRES) =     0.36       SUBAREA RUNOFF(CFS) =    1.45
               AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =       0.5        PEAK FLOW RATE(CFS) =      1.86

               END OF SUBAREA CHANNEL FLOW HYDRAULICS:
        DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   2.26
  LONGEST FLOWPATH FROM NODE    230.00 TO NODE    220.00 =     481.00 FEET.

****************************************************************************
     FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
          >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
          100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.790
                        *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
               AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
     SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    2.00
     TOTAL AREA(ACRES) =       0.9   TOTAL RUNOFF(CFS) =       3.86
                           TC(MIN.) =    6.72

****************************************************************************
     FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
          >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
         >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
                     TOTAL NUMBER OF STREAMS =  2
          CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
                TIME OF CONCENTRATION(MIN.) =    6.72
```

RAINFALL INTENSITY(INCH/HR) = 4.79
TOTAL STREAM AREA(ACRES) = 0.95
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.86

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.62	7.95	4.299	2.34
2	3.86	6.72	4.790	0.95

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	12.00	6.72	4.790
2	13.09	7.95	4.299

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 13.09 Tc(MIN.) = 7.95
TOTAL AREA(ACRES) = 3.3
LONGEST FLOWPATH FROM NODE 190.00 TO NODE 220.00 = 1013.00 FEET.

****
FLOW PROCESS FROM NODE 220.00 TO NODE 500.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 1 USED)<<<<<
==
UPSTREAM ELEVATION(FEET) = 300.40 DOWNSTREAM ELEVATION(FEET) = 291.00
STREET LENGTH(FEET) = 290.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 10.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
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) = 0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 13.11
STREET FLOWING FULL
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.34
HALFSTREET FLOOD WIDTH(FEET) = 10.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.11
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.75
STREET FLOW TRAVEL TIME(MIN.) = 0.95 Tc(MIN.) = 8.89
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.998
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
SUBAREA AREA(ACRES) = 0.01 SUBAREA RUNOFF(CFS) = 0.03
TOTAL AREA(ACRES) = 3.3 PEAK FLOW RATE(CFS) = 13.09

END OF SUBAREA STREET FLOW HYDRAULICS:

```
     DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.00
  FLOW VELOCITY(FEET/SEC.) =  5.10   DEPTH*VELOCITY(FT*FT/SEC.) =   1.75
 LONGEST FLOWPATH FROM NODE    190.00 TO NODE    500.00 =    1303.00 FEET.

****************************************************************************
   FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 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       13.09     8.89       3.998        3.30
 LONGEST FLOWPATH FROM NODE    190.00 TO NODE    500.00 =    1303.00 FEET.

              ** MEMORY BANK #  1 CONFLUENCE DATA **
         STREAM     RUNOFF      Tc      INTENSITY     AREA
         NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
           1        7.99    10.43       3.608        2.54
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    500.00 =   15971.00 FEET.

                  ** PEAK FLOW RATE TABLE **
             STREAM    RUNOFF       Tc      INTENSITY
             NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
               1      19.91       8.89        3.998
               2      19.81      10.43        3.608

          COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
      PEAK FLOW RATE(CFS) =      19.91   Tc(MIN.) =    8.89
                TOTAL AREA(ACRES) =       5.8

****************************************************************************
   FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  12
----------------------------------------------------------------------------
                >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
   FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 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       19.91     8.89       3.998        5.84
 LONGEST FLOWPATH FROM NODE    150.00 TO NODE    500.00 =   15971.00 FEET.

              ** MEMORY BANK #  2 CONFLUENCE DATA **
         STREAM     RUNOFF      Tc      INTENSITY     AREA
         NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
           1        3.02     6.90       4.708        0.75
 LONGEST FLOWPATH FROM NODE    170.00 TO NODE    500.00 =     401.00 FEET.

                  ** PEAK FLOW RATE TABLE **
             STREAM    RUNOFF       Tc      INTENSITY
             NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
               1      18.47       6.90        4.708
```

```
              2      22.47       8.89        3.998

         COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
     PEAK FLOW RATE(CFS) =      22.47   Tc(MIN.) =    8.89
                TOTAL AREA(ACRES) =       6.6

****************************************************************************
      FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  12
----------------------------------------------------------------------------
                   >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================
============================================================================
                        END OF STUDY SUMMARY:
          TOTAL AREA(ACRES)     =        6.6  TC(MIN.) =      8.89
                  PEAK FLOW RATE(CFS)   =      22.47
============================================================================
============================================================================
                      END OF RATIONAL METHOD ANALYSIS
```

APPENDIX B

AES CALCULATIONS

POST-DEVELOPMENT

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2012 Advanced Engineering Software (aes)
             Ver. 19.0 Release Date: 06/01/2012  License ID 1503

                           Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
* CLAIREMONT VILLAGE                                                       *
* 100 YEAR STORM                                                           *
* POST DEVELOPMENT CONDITIONS                                              *
 **************************************************************************

  FILE NAME: CVP100.DAT
  TIME/DATE OF STUDY: 10:31 09/10/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  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 =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7900
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    327.00
  DOWNSTREAM ELEVATION(FEET) =    324.00
```

```
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.567
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    85.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE     10.10 TO NODE     10.20 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    324.00  DOWNSTREAM(FEET) =    311.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   345.00   CHANNEL SLOPE =  0.0377
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.302
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (DIRT) RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.95
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.64
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   2.17
  Tc(MIN.) =    5.74
  SUBAREA AREA(ACRES) =     0.28       SUBAREA RUNOFF(CFS) =    1.26
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.838
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.30
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     10.20 =     445.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.20 TO NODE     10.30 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   303.00  DOWNSTREAM(FEET) =   301.65
  FLOW LENGTH(FEET) =   135.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.15
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.56
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =    6.28
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     10.30 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.30 TO NODE     10.30 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.002
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
```

```
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8438
  SUBAREA AREA(ACRES) =    0.33   SUBAREA RUNOFF(CFS) =    1.40
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       2.87
  TC(MIN.) =    6.28

****************************************************************************
  FLOW PROCESS FROM NODE     10.30 TO NODE     20.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   301.65  DOWNSTREAM(FEET) =   299.05
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.94
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.87
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     20.00 =     840.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.597
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8456
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    1.09
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       3.73
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   299.05  DOWNSTREAM(FEET) =   298.74
  FLOW LENGTH(FEET) =    31.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.35
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        3.73
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    7.26
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     871.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    310.00
  DOWNSTREAM ELEVATION(FEET) =    309.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.734
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.44

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) =  309.00  DOWNSTREAM ELEVATION(FEET) =  306.00
  STREET LENGTH(FEET) =   105.00   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 =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.91
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.77
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.60
  STREET FLOW TRAVEL TIME(MIN.) =   0.63   Tc(MIN.) =    3.37
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    0.19      SUBAREA RUNOFF(CFS) =    0.94
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.38

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.85
  FLOW VELOCITY(FEET/SEC.) =  3.00   DEPTH*VELOCITY(FT*FT/SEC.) =   0.73
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     160.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   304.00  DOWNSTREAM(FEET) =   303.00
  FLOW LENGTH(FEET) =    87.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.35
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.38
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    3.70
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     70.00 =     247.00 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.) =    3.70
  RAINFALL INTENSITY(INCH/HR) =   5.80
  TOTAL STREAM AREA(ACRES) =     0.28
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.38

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7000
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    317.00
  DOWNSTREAM ELEVATION(FEET) =    316.60
  ELEVATION DIFFERENCE(FEET) =      0.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.554
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE     80.10 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    316.60  DOWNSTREAM(FEET) =    311.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   495.00   CHANNEL SLOPE =  0.0101
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.297
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (43. DU/AC OR LESS) RUNOFF COEFFICIENT = .7000
  S.C.S. CURVE NUMBER (AMC II) =  94
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.36
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.43
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   3.40
  Tc(MIN.) =    7.95
  SUBAREA AREA(ACRES) =     1.43       SUBAREA RUNOFF(CFS) =    4.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.700
  TOTAL AREA(ACRES) =       1.5         PEAK FLOW RATE(CFS) =       4.42
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   2.95
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     90.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   303.00  DOWNSTREAM(FEET) =   302.50
  FLOW LENGTH(FEET) =    50.00   MANNING'S N = 0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.55
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        4.42
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    8.10
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     70.00 =     585.00 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.) =    8.10
  RAINFALL INTENSITY(INCH/HR) =   4.25
  TOTAL STREAM AREA(ACRES) =     1.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.38     3.70        5.796          0.28
      2        4.42     8.10        4.246          1.47

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.40     3.70       5.796
      2        5.43     8.10       4.246

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.43   Tc(MIN.) =    8.10
  TOTAL AREA(ACRES) =        1.7
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     70.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     30.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   300.00  DOWNSTREAM(FEET) =   298.23
```

```
  FLOW LENGTH(FEET) =   177.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.77
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        5.43
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    8.61
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     30.00 =     762.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 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         5.43     8.61       4.082        1.75
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     30.00 =     762.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1         3.73     7.26       4.558        0.96
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     871.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)      (MIN.)   (INCH/HOUR)
     1        8.31       7.26        4.558
     2        8.77       8.61        4.082

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.77   Tc(MIN.) =    8.61
  TOTAL AREA(ACRES) =        2.7

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   298.23  DOWNSTREAM(FEET) =   297.35
  FLOW LENGTH(FEET) =    97.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.25
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        8.77
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    8.87
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =     968.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  10
----------------------------------------------------------------------------
```

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

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    63.00
  UPSTREAM ELEVATION(FEET) =    304.60
  DOWNSTREAM ELEVATION(FEET) =    304.30
  ELEVATION DIFFERENCE(FEET) =      0.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.009
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.34

****************************************************************************
  FLOW PROCESS FROM NODE    120.10 TO NODE    120.20 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    304.30  DOWNSTREAM(FEET) =    303.28
  CHANNEL LENGTH THRU SUBAREA(FEET) =   100.00   CHANNEL SLOPE =  0.0102
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.60
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.64
  Tc(MIN.) =    4.65
  SUBAREA AREA(ACRES) =     0.95       SUBAREA RUNOFF(CFS) =    4.68
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       5.03

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   3.10
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    120.20 =     163.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.20 TO NODE    120.20 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
```

```
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.64
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       5.67
  TC(MIN.) =    4.65

****************************************************************************
  FLOW PROCESS FROM NODE    120.20 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   302.24  DOWNSTREAM(FEET) =   300.00
  FLOW LENGTH(FEET) =   211.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.96
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.67
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    5.24
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    110.00 =     374.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.623
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.33   SUBAREA RUNOFF(CFS) =    1.58
  TOTAL AREA(ACRES) =        1.5   TOTAL RUNOFF(CFS) =       7.07
  TC(MIN.) =    5.24

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    30.00
  UPSTREAM ELEVATION(FEET) =    304.60
  DOWNSTREAM ELEVATION(FEET) =    304.30
  ELEVATION DIFFERENCE(FEET) =      0.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.465
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.44
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.44
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    100.10 TO NODE    110.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    304.30  DOWNSTREAM(FEET) =    303.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   335.00   CHANNEL SLOPE =  0.0018
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR = 10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.695
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.87
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.25
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   4.47
  Tc(MIN.) =    6.93
  SUBAREA AREA(ACRES) =     0.70       SUBAREA RUNOFF(CFS) =    2.79
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   1.46
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 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        3.15     6.93       4.695        0.79
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     365.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        8.77     8.87       4.004        2.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =     968.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      10.01       6.93        4.695
     2      11.46       8.87        4.004

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      11.46   Tc(MIN.) =    8.87
  TOTAL AREA(ACRES) =        3.5

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 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       11.46     8.87       4.004        3.50
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    110.00 =     968.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        7.07     5.24       5.623        1.48
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    110.00 =     374.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      13.85       5.24        5.623
      2      16.50       8.87        4.004

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.50   Tc(MIN.) =    8.87
  TOTAL AREA(ACRES) =        5.0

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   297.35  DOWNSTREAM(FEET) =   293.98
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.46
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.50
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    9.36
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    140.00 =    1218.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    304.00
  DOWNSTREAM ELEVATION(FEET) =    303.52
  ELEVATION DIFFERENCE(FEET) =      0.48
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.009
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.43
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      1.43

****************************************************************************
  FLOW PROCESS FROM NODE    150.10 TO NODE    150.20 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   297.33  DOWNSTREAM(FEET) =   296.57
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.03
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.43
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    4.09
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    150.20 =     129.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.20 TO NODE    150.20 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    150.30 TO NODE    150.30 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    20.00
  UPSTREAM ELEVATION(FEET) =    301.70
  DOWNSTREAM ELEVATION(FEET) =    301.50
  ELEVATION DIFFERENCE(FEET) =      0.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.012
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    150.30 TO NODE    150.20 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   301.50  DOWNSTREAM(FEET) =   297.02
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  4.000
  DEPTH OF FLOW IN   4.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.43
  ESTIMATED PIPE DIAMETER(INCH) =   4.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        0.25
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    2.08
  LONGEST FLOWPATH FROM NODE    150.30 TO NODE    150.20 =      50.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    150.20 TO NODE    150.20 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        0.25     2.08       5.796        0.05
  LONGEST FLOWPATH FROM NODE    150.30 TO NODE    150.20 =      50.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.43     4.09       5.796        0.29
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    150.20 =     129.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       0.97       2.08        5.796
      2       1.68       4.09        5.796

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.68   Tc(MIN.) =    4.09
  TOTAL AREA(ACRES) =         0.3

******************************************************************************
  FLOW PROCESS FROM NODE    150.20 TO NODE    150.20 IS CODE =  12
------------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE    150.20 TO NODE    160.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   296.57  DOWNSTREAM(FEET) =   295.61
  FLOW LENGTH(FEET) =    34.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.47
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.68
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    4.18
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    160.00 =     163.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.94
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.61
  TC(MIN.) =    4.18

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    170.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   295.61  DOWNSTREAM(FEET) =   294.89
  FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.79
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.61
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    4.24
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    170.00 =     190.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    140.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   294.89  DOWNSTREAM(FEET) =   294.48
  FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.19
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.61
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    4.30
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    140.00 =     212.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 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        2.61     4.30       5.796        0.53
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    140.00 =     212.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       16.50     9.36       3.867        4.98
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    140.00 =    1218.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      10.19       4.30       5.796
      2      18.24       9.36       3.867

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.24   Tc(MIN.) =    9.36
  TOTAL AREA(ACRES) =        5.5

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   293.48  DOWNSTREAM(FEET) =   292.97
  FLOW LENGTH(FEET) =    79.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.70
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.24
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    9.56
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    190.00 =    1297.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.816
  *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8116
  SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    1.10
  TOTAL AREA(ACRES) =        5.9   TOTAL RUNOFF(CFS) =      18.24
  TC(MIN.) =    9.56
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    200.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   292.97  DOWNSTREAM(FEET) =   292.73
  FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.71
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.24
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    9.65
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    200.00 =    1334.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   292.73  DOWNSTREAM(FEET) =   291.94
  FLOW LENGTH(FEET) =   121.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.73
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.24
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    9.95
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE    130.00 =    1455.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.718
   *USER SPECIFIED(SUBAREA):
  NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8120
  SUBAREA AREA(ACRES) =    0.07   SUBAREA RUNOFF(CFS) =    0.22
  TOTAL AREA(ACRES) =        5.9   TOTAL RUNOFF(CFS) =      18.24
  TC(MIN.) =    9.95
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.9  TC(MIN.) =      9.95
  PEAK FLOW RATE(CFS)   =      18.24
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                     2003,1985,1981 HYDROLOGY MANUAL
       (c) Copyright 1982-2012 Advanced Engineering Software (aes)
           Ver. 19.0 Release Date: 06/01/2012  License ID 1503

                          Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
 * 325-17 CLAIREMONT VILLAGE                                                *
 * WESTERLY POC 2 ANALYSIS                                                  *
 * DOES NOT CONFLUENCE WITH PROJECT SITE                                    *
 **************************************************************************

                         FILE NAME: 325E100.DAT
                  TIME/DATE OF STUDY: 16:50 04/20/2022
----------------------------------------------------------------------------
        USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
                      2003 SAN DIEGO MANUAL CRITERIA

                 USER SPECIFIED STORM EVENT(YEAR) = 100.00
             6-HOUR DURATION PRECIPITATION (INCHES) =   2.200
                SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
       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   10.0      5.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0130

                   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 = 10.0 (FT*FT/S)
                 *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
                  OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
      FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  22
----------------------------------------------------------------------------
            >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                       *USER SPECIFIED(SUBAREA):
                 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                    S.C.S. CURVE NUMBER (AMC II) =   0
                    USER SPECIFIED Tc(MIN.) =    5.000
           100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                      SUBAREA RUNOFF(CFS) =     0.25
```

```
TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    298.94  DOWNSTREAM(FEET) =    296.75
CHANNEL LENGTH THRU SUBAREA(FEET) =   146.00   CHANNEL SLOPE =  0.0150
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.773
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.38
AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.76
Tc(MIN.) =    6.76
SUBAREA AREA(ACRES) =     0.16       SUBAREA RUNOFF(CFS) =    0.65
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =       0.2        PEAK FLOW RATE(CFS) =       0.86

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.65
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     146.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.773
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    1.00
TOTAL AREA(ACRES) =       0.5   TOTAL RUNOFF(CFS) =       1.86
TC(MIN.) =    6.76

****************************************************************************
FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 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.) =    6.76
RAINFALL INTENSITY(INCH/HR) =   4.77
TOTAL STREAM AREA(ACRES) =     0.46
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.86

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  22
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
```

```
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
                 USER SPECIFIED Tc(MIN.) =    5.000
          100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                  SUBAREA RUNOFF(CFS) =      0.27
     TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
     FLOW PROCESS FROM NODE     50.00 TO NODE     30.00 IS CODE =  51
----------------------------------------------------------------------------
              >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
         >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.66  DOWNSTREAM(FEET) =    302.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   232.00   CHANNEL SLOPE =  0.0072
            CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
          MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
          100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.332
                     *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
      TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
     TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
     AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.85
                      Tc(MIN.) =    7.85
     SUBAREA AREA(ACRES) =     0.39      SUBAREA RUNOFF(CFS) =    1.44
               AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
   TOTAL AREA(ACRES) =       0.4        PEAK FLOW RATE(CFS) =       1.64

               END OF SUBAREA CHANNEL FLOW HYDRAULICS:
          DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.66
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     30.00 =     378.00 FEET.

****************************************************************************
     FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
           >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
          >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
                    TOTAL NUMBER OF STREAMS =  2
           CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
                 TIME OF CONCENTRATION(MIN.) =    7.85
                 RAINFALL INTENSITY(INCH/HR) =   4.33
                  TOTAL STREAM AREA(ACRES) =     0.45
             PEAK FLOW RATE(CFS) AT CONFLUENCE =     1.64

                      ** CONFLUENCE DATA **
            STREAM     RUNOFF       Tc      INTENSITY      AREA
            NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
             1        1.86     6.76        4.773          0.46
             2        1.64     7.85        4.332          0.45

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

                      ** PEAK FLOW RATE TABLE **
                  STREAM     RUNOFF      Tc      INTENSITY
                  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
                     1         3.27     6.76       4.773
                     2         3.33     7.85       4.332
```

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       3.33   Tc(MIN.) =    7.85
TOTAL AREA(ACRES) =        0.9
LONGEST FLOWPATH FROM NODE     40.00 TO NODE     30.00 =     378.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     30.00 TO NODE     60.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  302.00  DOWNSTREAM ELEVATION(FEET) =  293.00
STREET LENGTH(FEET) =   309.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 10.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
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) =   0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.35
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) =  0.29
HALFSTREET FLOOD WIDTH(FEET) =    8.40
AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.06
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.20
STREET FLOW TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    9.12
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.934
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
SUBAREA AREA(ACRES) =    0.01      SUBAREA RUNOFF(CFS) =    0.04
TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.33

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.40
FLOW VELOCITY(FEET/SEC.) =  4.04   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     687.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  22
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
USER SPECIFIED Tc(MIN.) =    5.000
```

```
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
SUBAREA RUNOFF(CFS) =      0.28
TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    300.61
CHANNEL LENGTH THRU SUBAREA(FEET) =   139.00   CHANNEL SLOPE =  0.0237
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.051
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.85
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.95
AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.19
Tc(MIN.) =    6.19
SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =    1.15
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.40

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.33
LONGEST FLOWPATH FROM NODE     70.00 TO NODE     90.00 =     448.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     90.00 TO NODE     90.10 IS CODE =  91
----------------------------------------------------------------------------
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
UPSTREAM NODE ELEVATION(FEET) =    300.61
DOWNSTREAM NODE ELEVATION(FEET) =    293.66
CHANNEL LENGTH THRU SUBAREA(FEET) =   166.00
"V" GUTTER WIDTH(FEET) =   1.50   GUTTER HIKE(FEET) =  0.250
PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) =   1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.845
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.42
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.69
AVERAGE FLOW DEPTH(FEET) =   0.35   FLOOD WIDTH(FEET) =    1.50
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.41   Tc(MIN.) =    6.60
SUBAREA AREA(ACRES) =    0.01       SUBAREA RUNOFF(CFS) =    0.04
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.40

NOTE:TRAVEL TIME ESTIMATES BASED ON NORMAL
DEPTH EQUAL TO [GUTTER-HIKE + PAVEMENT LIP]

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.35   FLOOD WIDTH(FEET) =    1.50
FLOW VELOCITY(FEET/SEC.) =   6.69   DEPTH*VELOCITY(FT*FT/SEC) =   2.34
```

```
 LONGEST FLOWPATH FROM NODE     70.00 TO NODE     90.10 =    614.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE     90.10 TO NODE     90.10 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.) =    6.60
                 RAINFALL INTENSITY(INCH/HR) =   4.84
                  TOTAL STREAM AREA(ACRES) =     0.34
              PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.40

****************************************************************************
      FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  22
----------------------------------------------------------------------------
            >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                      *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
                 USER SPECIFIED Tc(MIN.) =    5.000
            100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                   SUBAREA RUNOFF(CFS) =      0.37
       TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
      FLOW PROCESS FROM NODE    110.00 TO NODE     90.10 IS CODE =  51
----------------------------------------------------------------------------
                >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
           >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    293.66
   CHANNEL LENGTH THRU SUBAREA(FEET) =   252.00   CHANNEL SLOPE =  0.0406
            CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
          MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
            100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.853
                      *USER SPECIFIED(SUBAREA):
              USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                 S.C.S. CURVE NUMBER (AMC II) =   0
      TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.37
     TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.65
     AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.59
                          Tc(MIN.) =    6.59
    SUBAREA AREA(ACRES) =     0.49       SUBAREA RUNOFF(CFS) =    2.00
               AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.31

               END OF SUBAREA CHANNEL FLOW HYDRAULICS:
          DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE     90.10 =    418.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE     90.10 TO NODE     90.10 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.) = 6.59
RAINFALL INTENSITY(INCH/HR) = 4.85
TOTAL STREAM AREA(ACRES) = 0.56
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.31

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	1.40	6.60	4.845	0.34
2	2.31	6.59	4.853	0.56

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	3.70	6.59	4.853
2	3.70	6.60	4.845

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 3.70 Tc(MIN.) = 6.59
TOTAL AREA(ACRES) = 0.9
LONGEST FLOWPATH FROM NODE 70.00 TO NODE 90.10 = 614.00 FEET.

****
FLOW PROCESS FROM NODE 90.10 TO NODE 60.00 IS CODE = 91

>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

==

UPSTREAM NODE ELEVATION(FEET) = 293.66
DOWNSTREAM NODE ELEVATION(FEET) = 293.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 10.00
"V" GUTTER WIDTH(FEET) = 1.50 GUTTER HIKE(FEET) = 0.250
PAVEMENT LIP(FEET) = 0.100 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.844
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.72
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 8.28
AVERAGE FLOW DEPTH(FEET) = 0.38 FLOOD WIDTH(FEET) = 4.96
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 6.61
SUBAREA AREA(ACRES) = 0.01 SUBAREA RUNOFF(CFS) = 0.04
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 3.73

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.39 FLOOD WIDTH(FEET) = 5.13
FLOW VELOCITY(FEET/SEC.) = 8.14 DEPTH*VELOCITY(FT*FT/SEC) = 3.14
LONGEST FLOWPATH FROM NODE 70.00 TO NODE 60.00 = 624.00 FEET.

****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 10

>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<

==

```
****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  USER SPECIFIED Tc(MIN.) =    5.000
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
  SUBAREA RUNOFF(CFS) =      0.49
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE     60.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    297.42  DOWNSTREAM(FEET) =    293.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00   CHANNEL SLOPE =  0.0295
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.018
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.99
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.25
  Tc(MIN.) =    6.25
  SUBAREA AREA(ACRES) =     0.16       SUBAREA RUNOFF(CFS) =    0.68
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   2.23
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE     60.00 =     160.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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        1.11     6.25       5.018        0.26
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE     60.00 =     160.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1        3.33     9.12       3.934        0.91
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     687.00 FEET.

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

```
   NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1        3.39       6.25        5.018
      2        4.20       9.12        3.934

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =       4.20   Tc(MIN.) =    9.12
   TOTAL AREA(ACRES) =        1.2

****************************************************************************
   FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  12
----------------------------------------------------------------------------
   >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
   FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 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        4.20     9.12       3.934        1.17
   LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     687.00 FEET.

   ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM     RUNOFF      Tc      INTENSITY     AREA
   NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.73     6.61       4.844        0.90
   LONGEST FLOWPATH FROM NODE     70.00 TO NODE     60.00 =     624.00 FEET.

   ** PEAK FLOW RATE TABLE **
   STREAM    RUNOFF       Tc      INTENSITY
   NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1        6.77       6.61        4.844
      2        7.22       9.12        3.934

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =       7.22   Tc(MIN.) =    9.12
   TOTAL AREA(ACRES) =        2.1

****************************************************************************
   FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  12
----------------------------------------------------------------------------
   >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
   FLOW PROCESS FROM NODE     60.00 TO NODE    140.00 IS CODE =  62
----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
   UPSTREAM ELEVATION(FEET) =  293.00  DOWNSTREAM ELEVATION(FEET) =  291.87
   STREET LENGTH(FEET) =   158.00   CURB HEIGHT(INCHES) =  6.0
   STREET HALFWIDTH(FEET) = 10.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
   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) =   0.0130
    Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

      **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.24
                       ***STREET FLOWING FULL***
             STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
                    STREET FLOW DEPTH(FEET) =  0.36
                 HALFSTREET FLOOD WIDTH(FEET) =   10.00
               AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.55
             PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.91
        STREET FLOW TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =   10.15
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.671
                       *USER SPECIFIED(SUBAREA):
               USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                  S.C.S. CURVE NUMBER (AMC II) =   0
               AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
    SUBAREA AREA(ACRES) =    0.01      SUBAREA RUNOFF(CFS) =    0.03
  TOTAL AREA(ACRES) =       2.1        PEAK FLOW RATE(CFS) =      7.22

                 END OF SUBAREA STREET FLOW HYDRAULICS:
       DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.00
  FLOW VELOCITY(FEET/SEC.) =  2.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.91
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE    140.00 =     845.00 FEET.

****************************************************************************
    FLOW PROCESS FROM NODE    140.00 TO NODE    140.00 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.) =   10.15
                 RAINFALL INTENSITY(INCH/HR) =   3.67
                 TOTAL STREAM AREA(ACRES) =     2.09
             PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.22

****************************************************************************
    FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  22
----------------------------------------------------------------------------
           >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                       *USER SPECIFIED(SUBAREA):
               USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                  S.C.S. CURVE NUMBER (AMC II) =   0
                  USER SPECIFIED Tc(MIN.) =    5.000
             100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                    SUBAREA RUNOFF(CFS) =      0.49
      TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
    FLOW PROCESS FROM NODE    160.00 TO NODE    140.00 IS CODE =  51
----------------------------------------------------------------------------
               >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
          >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    294.85  DOWNSTREAM(FEET) =    291.87
```

CHANNEL LENGTH THRU SUBAREA(FEET) = 115.00 CHANNEL SLOPE = 0.0259
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.161
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.81
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.94
AVERAGE FLOW DEPTH(FEET) = 0.04 TRAVEL TIME(MIN.) = 0.99
Tc(MIN.) = 5.99
SUBAREA AREA(ACRES) = 0.15 SUBAREA RUNOFF(CFS) = 0.64
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
TOTAL AREA(ACRES) = 0.2 PEAK FLOW RATE(CFS) = 1.08

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.05 FLOW VELOCITY(FEET/SEC.) = 2.08
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 140.00 = 15915.00 FEET.

****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.99
RAINFALL INTENSITY(INCH/HR) = 5.16
TOTAL STREAM AREA(ACRES) = 0.25
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.08

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	7.22	10.15	3.671	2.09
2	1.08	5.99	5.161	0.25

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	5.34	5.99	5.161
2	7.99	10.15	3.671

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 7.99 Tc(MIN.) = 10.15
TOTAL AREA(ACRES) = 2.3
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 140.00 = 15915.00 FEET.

****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.671
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500

S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
SUBAREA AREA(ACRES) = 0.19 SUBAREA RUNOFF(CFS) = 0.60
TOTAL AREA(ACRES) = 2.5 TOTAL RUNOFF(CFS) = 7.99
TC(MIN.) = 10.15
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****
FLOW PROCESS FROM NODE 140.00 TO NODE 500.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 1 USED)<<<<<
==
UPSTREAM ELEVATION(FEET) = 291.87 DOWNSTREAM ELEVATION(FEET) = 291.00
STREET LENGTH(FEET) = 56.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 10.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
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) = 0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.01
STREET FLOWING FULL
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.33
HALFSTREET FLOOD WIDTH(FEET) = 10.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.38
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.12
STREET FLOW TRAVEL TIME(MIN.) = 0.28 Tc(MIN.) = 10.43
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.608
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
SUBAREA AREA(ACRES) = 0.01 SUBAREA RUNOFF(CFS) = 0.03
TOTAL AREA(ACRES) = 2.5 PEAK FLOW RATE(CFS) = 7.99

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.33 HALFSTREET FLOOD WIDTH(FEET) = 10.00
FLOW VELOCITY(FEET/SEC.) = 3.37 DEPTH*VELOCITY(FT*FT/SEC.) = 1.12
LONGEST FLOWPATH FROM NODE 150.00 TO NODE 500.00 = 15971.00 FEET.

****
FLOW PROCESS FROM NODE 500.00 TO NODE 500.00 IS CODE = 10

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

****
FLOW PROCESS FROM NODE 170.00 TO NODE 180.00 IS CODE = 22

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500

```
                    S.C.S. CURVE NUMBER (AMC II) =   0
                    USER SPECIFIED Tc(MIN.) =    5.000
              100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                     SUBAREA RUNOFF(CFS) =      0.49
        TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
       FLOW PROCESS FROM NODE    180.00 TO NODE    500.00 IS CODE =  51
----------------------------------------------------------------------------
               >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
          >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    291.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   345.00   CHANNEL SLOPE =  0.0374
            CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
          MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
              100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.708
                        *USER SPECIFIED(SUBAREA):
                 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                    S.C.S. CURVE NUMBER (AMC II) =   0
         TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.81
       TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.02
       AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.90
                           Tc(MIN.) =    6.90
     SUBAREA AREA(ACRES) =     0.65       SUBAREA RUNOFF(CFS) =    2.62
                 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
   TOTAL AREA(ACRES) =       0.8         PEAK FLOW RATE(CFS) =       3.02

                  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
          DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.58
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    500.00 =     401.00 FEET.

****************************************************************************
       FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  10
----------------------------------------------------------------------------
         >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
       FLOW PROCESS FROM NODE    190.00 TO NODE    200.00 IS CODE =  22
----------------------------------------------------------------------------
            >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                        *USER SPECIFIED(SUBAREA):
                 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                    S.C.S. CURVE NUMBER (AMC II) =   0
                    USER SPECIFIED Tc(MIN.) =    5.000
              100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                     SUBAREA RUNOFF(CFS) =      0.72
        TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
       FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  51
----------------------------------------------------------------------------
               >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
          >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    316.00  DOWNSTREAM(FEET) =    304.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   397.00   CHANNEL SLOPE =  0.0302
            CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
```

```
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.851
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.26
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.16
AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.59
Tc(MIN.) =    6.59
SUBAREA AREA(ACRES) =     2.19       SUBAREA RUNOFF(CFS) =    9.02
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.62

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   5.13
LONGEST FLOWPATH FROM NODE    190.00 TO NODE    210.00 =     742.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  91
----------------------------------------------------------------------------
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
UPSTREAM NODE ELEVATION(FEET) =    304.00
DOWNSTREAM NODE ELEVATION(FEET) =    300.40
CHANNEL LENGTH THRU SUBAREA(FEET) =   271.00
"V" GUTTER WIDTH(FEET) =   1.50   GUTTER HIKE(FEET) =  0.250
PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) =   2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.299
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) =   0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.64
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.32
AVERAGE FLOW DEPTH(FEET) =   0.56   FLOOD WIDTH(FEET) =   22.69
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.36   Tc(MIN.) =    7.95
SUBAREA AREA(ACRES) =    0.01       SUBAREA RUNOFF(CFS) =    0.04
AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
TOTAL AREA(ACRES) =        2.3        PEAK FLOW RATE(CFS) =       9.62

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.56   FLOOD WIDTH(FEET) =   22.69
FLOW VELOCITY(FEET/SEC.) =   3.32   DEPTH*VELOCITY(FT*FT/SEC) =   1.86
LONGEST FLOWPATH FROM NODE    190.00 TO NODE    220.00 =    1013.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =    7.95
RAINFALL INTENSITY(INCH/HR) =   4.30
TOTAL STREAM AREA(ACRES) =     2.34
PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.62

****************************************************************************
FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  22
```

```
----------------------------------------------------------------------------
         >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
                     *USER SPECIFIED(SUBAREA):
             USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                S.C.S. CURVE NUMBER (AMC II) =   0
                USER SPECIFIED Tc(MIN.) =    5.000
         100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.796
                 SUBAREA RUNOFF(CFS) =     0.49
       TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
      FLOW PROCESS FROM NODE    240.00 TO NODE    220.00 IS CODE =  51
----------------------------------------------------------------------------
             >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
         >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    303.90  DOWNSTREAM(FEET) =    300.40
   CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00   CHANNEL SLOPE =  0.0167
          CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
        MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
         100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.790
                     *USER SPECIFIED(SUBAREA):
             USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                S.C.S. CURVE NUMBER (AMC II) =   0
        TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.22
      TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
      AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.72
                        Tc(MIN.) =    6.72
     SUBAREA AREA(ACRES) =     0.36       SUBAREA RUNOFF(CFS) =    1.45
             AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
   TOTAL AREA(ACRES) =       0.5        PEAK FLOW RATE(CFS) =      1.86

              END OF SUBAREA CHANNEL FLOW HYDRAULICS:
        DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   2.26
  LONGEST FLOWPATH FROM NODE    230.00 TO NODE    220.00 =    481.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
          >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
         100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.790
                     *USER SPECIFIED(SUBAREA):
             USER-SPECIFIED RUNOFF COEFFICIENT = .8500
                S.C.S. CURVE NUMBER (AMC II) =   0
             AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
       SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    2.00
      TOTAL AREA(ACRES) =       0.9   TOTAL RUNOFF(CFS) =      3.86
                        TC(MIN.) =    6.72

****************************************************************************
      FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
         >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
        >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
                   TOTAL NUMBER OF STREAMS =  2
         CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
               TIME OF CONCENTRATION(MIN.) =    6.72
```

RAINFALL INTENSITY(INCH/HR) = 4.79
TOTAL STREAM AREA(ACRES) = 0.95
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.86

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.62	7.95	4.299	2.34
2	3.86	6.72	4.790	0.95

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	12.00	6.72	4.790
2	13.09	7.95	4.299

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 13.09 Tc(MIN.) = 7.95
TOTAL AREA(ACRES) = 3.3
LONGEST FLOWPATH FROM NODE 190.00 TO NODE 220.00 = 1013.00 FEET.

****
FLOW PROCESS FROM NODE 220.00 TO NODE 500.00 IS CODE = 62

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION # 1 USED)<<<<<
==
UPSTREAM ELEVATION(FEET) = 300.40 DOWNSTREAM ELEVATION(FEET) = 291.00
STREET LENGTH(FEET) = 290.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 10.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 5.00
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) = 0.0130
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

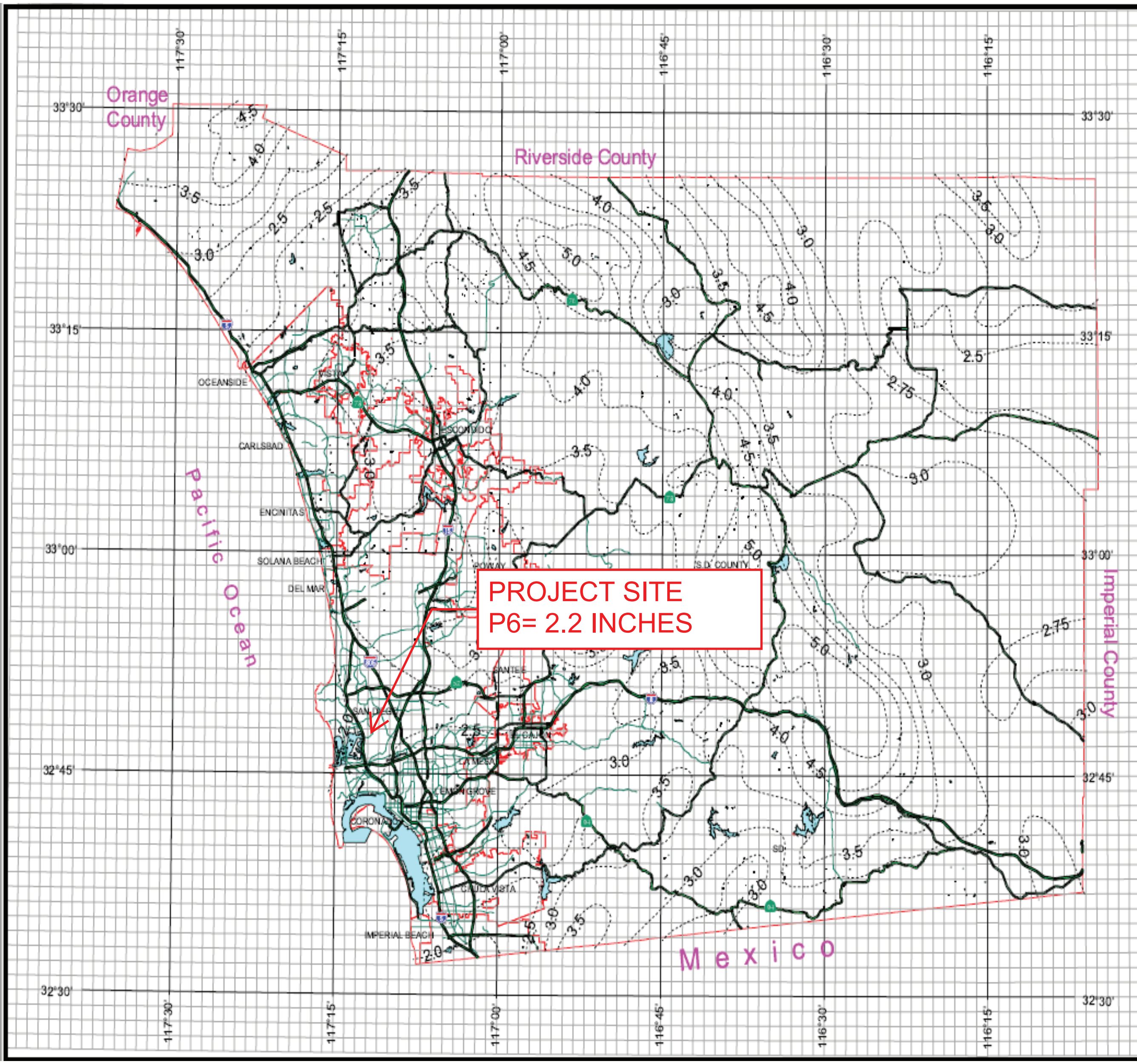
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 13.11
STREET FLOWING FULL
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.34
HALFSTREET FLOOD WIDTH(FEET) = 10.00
AVERAGE FLOW VELOCITY(FEET/SEC.) = 5.11
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.75
STREET FLOW TRAVEL TIME(MIN.) = 0.95 Tc(MIN.) = 8.89
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.998
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.850
SUBAREA AREA(ACRES) = 0.01 SUBAREA RUNOFF(CFS) = 0.03
TOTAL AREA(ACRES) = 3.3 PEAK FLOW RATE(CFS) = 13.09

END OF SUBAREA STREET FLOW HYDRAULICS:

```
       DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.00
   FLOW VELOCITY(FEET/SEC.) =  5.10   DEPTH*VELOCITY(FT*FT/SEC.) =   1.75
  LONGEST FLOWPATH FROM NODE    190.00 TO NODE    500.00 =    1303.00 FEET.

****************************************************************************
      FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 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       13.09     8.89       3.998        3.30
  LONGEST FLOWPATH FROM NODE    190.00 TO NODE    500.00 =    1303.00 FEET.

              ** MEMORY BANK #  1 CONFLUENCE DATA **
          STREAM     RUNOFF      Tc      INTENSITY     AREA
          NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
            1        7.99    10.43       3.608        2.54
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    500.00 =   15971.00 FEET.

                   ** PEAK FLOW RATE TABLE **
               STREAM    RUNOFF       Tc      INTENSITY
               NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
                 1      19.91       8.89        3.998
                 2      19.81      10.43        3.608

             COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
         PEAK FLOW RATE(CFS) =      19.91   Tc(MIN.) =    8.89
                  TOTAL AREA(ACRES) =       5.8

****************************************************************************
      FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  12
----------------------------------------------------------------------------
                  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
      FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 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       19.91     8.89       3.998        5.84
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    500.00 =   15971.00 FEET.

              ** MEMORY BANK #  2 CONFLUENCE DATA **
          STREAM     RUNOFF      Tc      INTENSITY     AREA
          NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
            1        3.02     6.90       4.708        0.75
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    500.00 =     401.00 FEET.

                   ** PEAK FLOW RATE TABLE **
               STREAM    RUNOFF       Tc      INTENSITY
               NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
                 1      18.47       6.90        4.708
```

```
          2      22.47       8.89        3.998

        COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
    PEAK FLOW RATE(CFS) =      22.47   Tc(MIN.) =    8.89
               TOTAL AREA(ACRES) =       6.6

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =  12
----------------------------------------------------------------------------
                  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================
============================================================================
                       END OF STUDY SUMMARY:
    TOTAL AREA(ACRES)     =        6.6  TC(MIN.) =      8.89
                PEAK FLOW RATE(CFS)   =      22.47
============================================================================
============================================================================
                 END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 2
PRE-DEVELOPMENT HYDROLOGY MAP



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

-------- Isopluvial (inches)

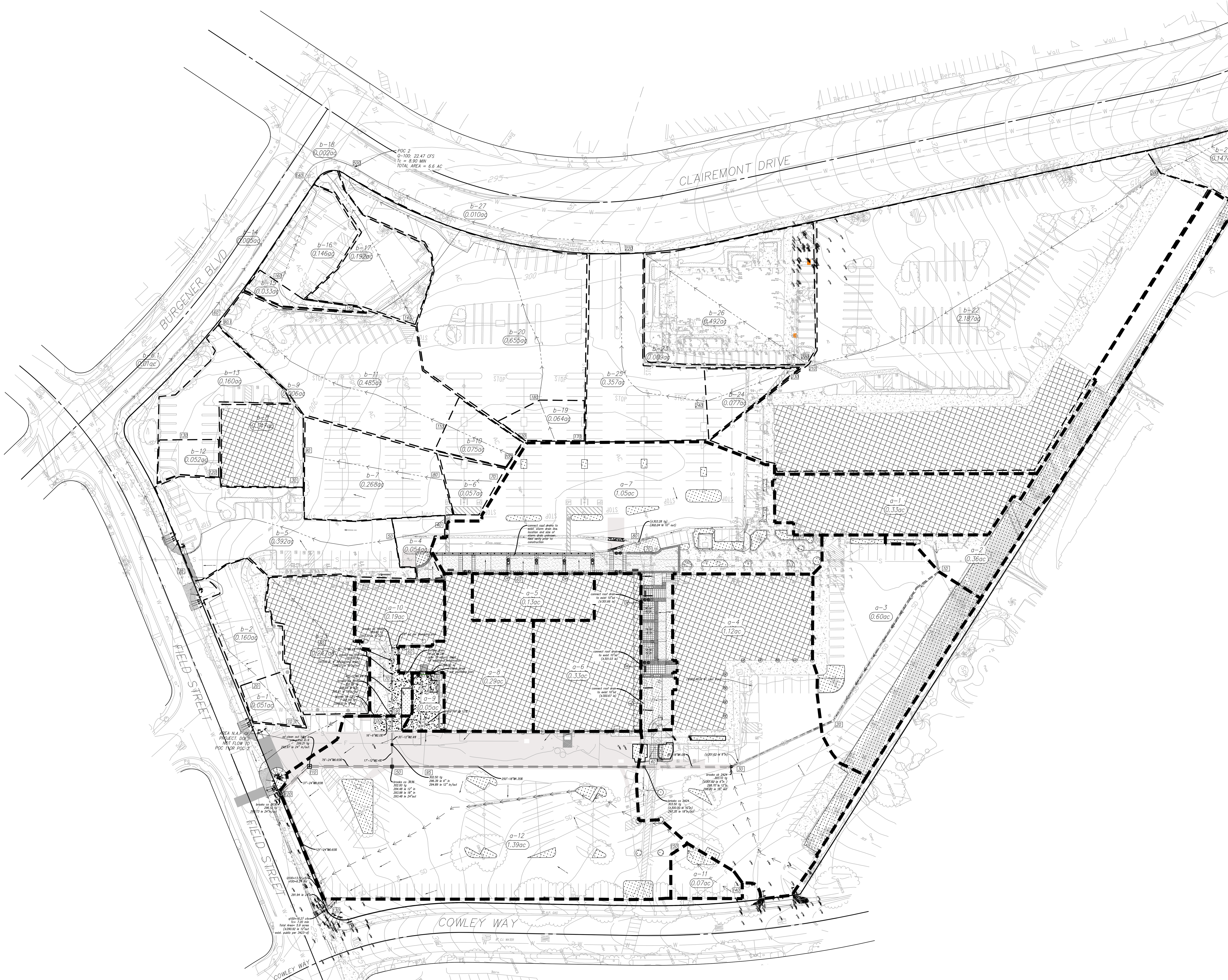
DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

PRE-DEVELOPMENT HYDROLOGY MAP FOR:
3007 CLAIREMONT VILLAGE



LEGEND

EXISTING IMPROVEMENTS

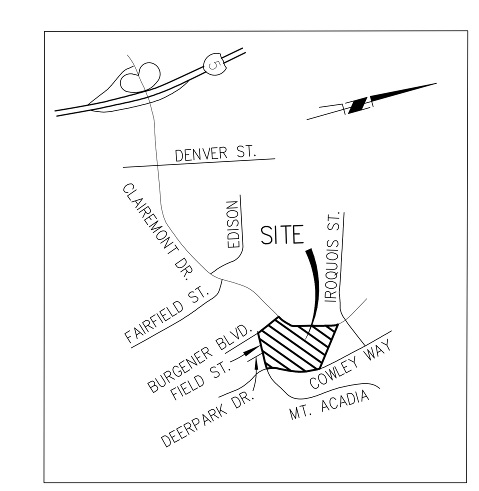
EXIST. ELECTRICAL LINE
EXIST. GAS LINE
EXIST. DOMESTIC WATER LINE
EXIST. SANITARY SEWER LINE
EXIST. STORM DRAIN LINE
EXIST. TELEPHONE LINE
EXIST. STREET LIGHT LINE
EXIST. conc. pvmt.
EXIST. FIRE HYDRANT
EXIST. POWER POLE
EXIST. STREET LIGHT
exist. contour
property line
exist. wall
exist. tree
EXIST. ROOF
exist. ROOf drain
EXIST. pervious

PROPOSED IMPROVEMENTS

6"pcc curb (pvt.)
6"pcc curb & GUTTER
pcc pavement
ac pavement
storm drain cleanout
storm drain catch basin
storm drain < 12" diameter
STORM DRAIN ≥ 12" DIAMETER
prop. ROOf
prop. ROOf drain
prop. pervious

DRAINAGE

hydrolength
drainage basin
drainage basin designator — a-12
drainage basin area — 1.39ac
node designator — 60



VICINITY MAP
NO SCALE

1239 CLAIREMONT VILLAGE SHOPPING CENTER
DRAINAGE CONDITIONS

Drainage Area #	Surface Type	Area sf	Area ac	Pervious [sf]	Pervious [ac]	Pervious Percentage [%]	Impervious [sf]	Impervious [ac]	Impervious Percentage [%]	Table 2 Commercial Imperviousness [%] per City of San Diego Drainage Design Manual	Table 2 Runoff Coeffficient for Commercial Development per City of San Diego Drainage Design Manual	Weighted Runoff Coefficient "C"	Adjusted Runoff Coefficient, C 0.5 < C < 0.85
A-1	Roof	14,453	0.33	0	0.00	0.00	14,453	0.33	100.00	80	0.85	1.06	0.85
A-2	AC Pvmt, conc pvmt, landscape	15,621	0.36	7,589	0.17	48.58	8,032	0.18	51.42	80	0.85	0.55	0.55
A-3	AC Pvmt, conc pvmt, landscape	26,039	0.60	6,176	0.14	23.72	19,863	0.46	76.28	80	0.85	0.81	0.81
A-4	Roof, AC pvmt, conc pvmt, landscape	48,671	1.12	1,790	0.04	3.68	46,881	1.08	96.32	80	0.85	1.02	0.85
A-5	Roof	5,787	0.13	0	0.00	0.00	5,787	0.13	100.00	80	0.85	1.06	0.85
A-6	Roof	14,312	0.33	1	0.00	0.01	14,311	0.33	99.99	80	0.85	1.06	0.85
A-7	AC Pvmt, conc pvmt, landscape	45,756	1.05	4,525	0.10	9.89	41,231	0.95	90.11	80	0.85	0.96	0.85
A-8	Roof	12,617	0.29	0	0.00	0.00	12,617	0.29	100.00	80	0.85	1.06	0.85
A-9	Loading Dock	1,992	0.05	0	0.00	0.00	1,992	0.05	100.00	80	0.85	1.06	0.85
A10	Roof, AC pvmt, conc pvmt	8,473	0.19	0	0.00	0.00	8,473	0.19	100.00	80	0.85	1.06	0.85
A-11	AC Pvmt, conc pvmt, landscape	2,959	0.07	0	0.00	0.00	2,959	0.07	100.00	80	0.85	1.06	0.85
A-12	AC Pvmt, conc pvmt, landscape	60,714	1.39	2,884	0.07	4.75	57,830	1.33	95.25	80	0.85	1.01	0.85
	Total	**257,394**	**5.91**	**22,965**	**0.53**	**8.92**	**234,430**	**5.38**	**91.08**	80	0.85	**0.97**	**0.85**

Runoff Coefficent C (Rational Method)*
(1) Type D to be used for all areas

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80%, the values given for coefficient C, may be revised by multiplying 80% by the ratio of actual imperviousness to the tabulated imperviousness. however, in no case shall the final coefficient be less than 0.50.

Example:
Actual Imperviousness = 50%
Tabulated Imperviousness = 80%

Revised C = (50/80) x 0.85 = 0.53

* Per Table 2 *Runoff Coefficients (Rational Method)* of City of San Diego Drainge Design Manual, dated April 1984

REGISTERED PROFESSIONAL ENGINEER
MELLOR R. LANDY
No. 81085
Exp. 09-30-21
CIVIL
STATE OF CALIFORNIA

SCALE: 1" = 40'

0 40' 80' 120'
SCALE: 1"= 40'

NOVA ENGINEERING
4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123
(619) 296-1010
JOB NO. XXXX

PRIVATE CONTRACT

3007 CLAIREMONT VILLAGE
FIELD STREET AND COWLEY WAY
PRE-DEVELOPMENT HYDROMAP

CITY OF SAN DIEGO, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
SHEET **1** OF **1** SHEETS

PROJECT NO. XXXXXX

FOR CITY ENGINEER — DATE

V.T.M.

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	NOVA			
AS-BUILTS				

XXXX-XXXX
NAD83 COORDINATES

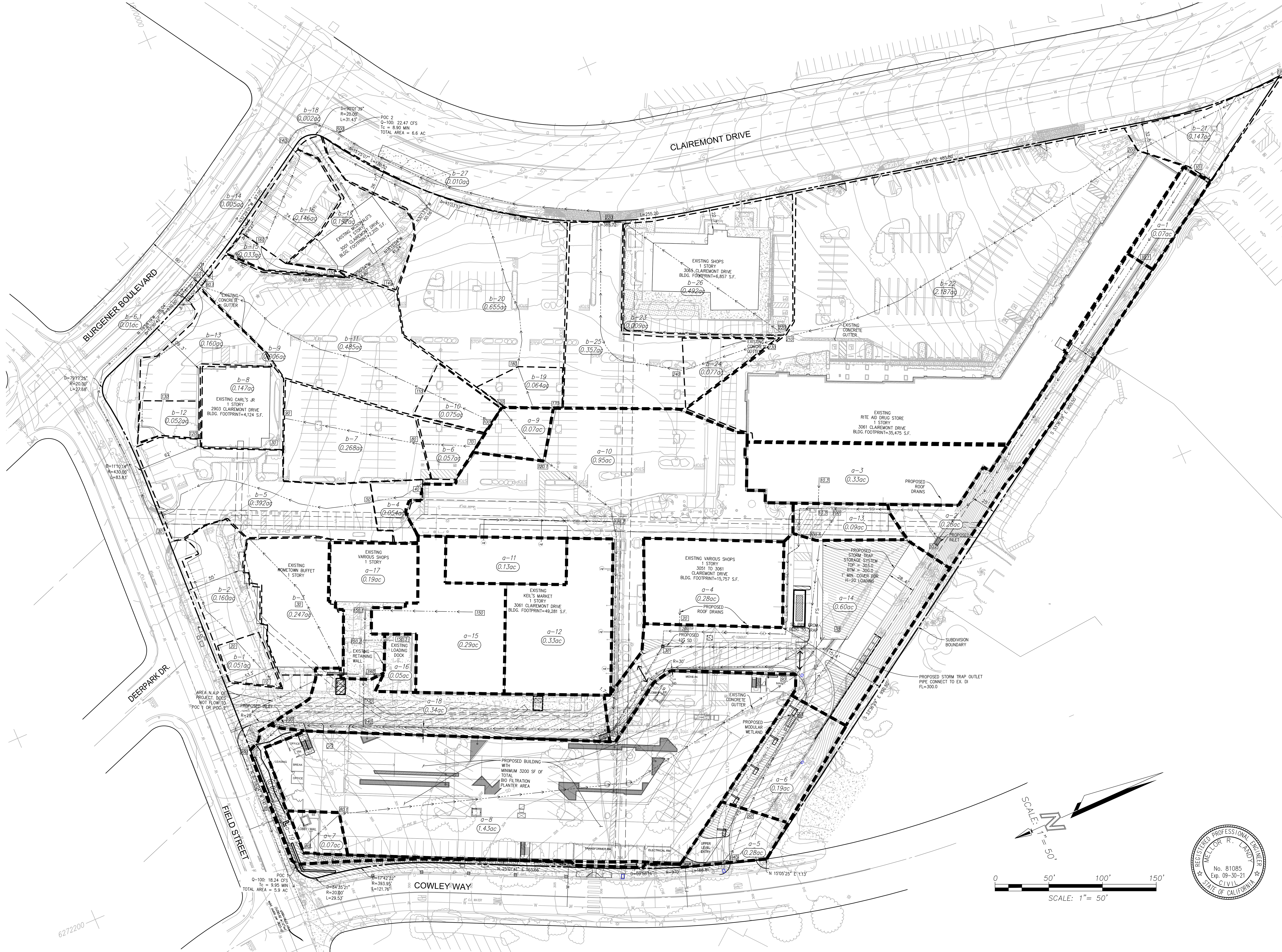
XXX-XXXX
LAMBERT COORDINATES

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

C-1

APPENDIX 2
POST-DEVELOPMENT HYDROLOGY MAP

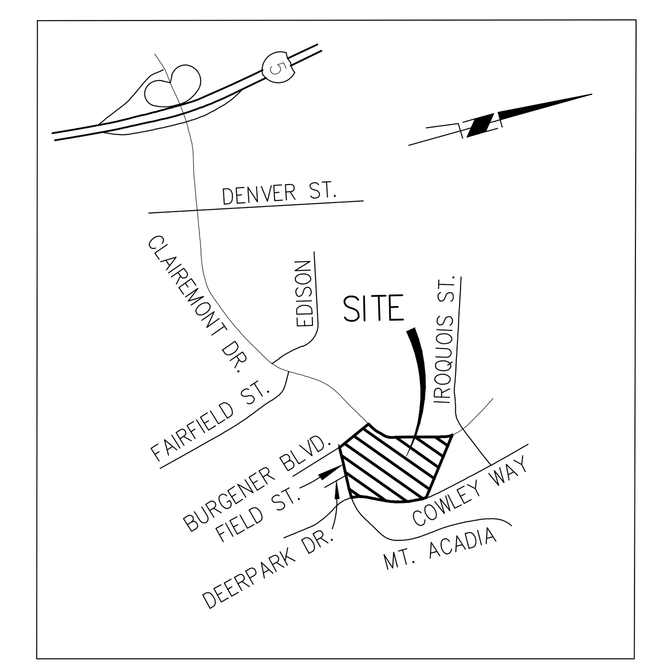
POST-DEVELOPMENT HYDROLOGY MAP FOR:
3007 CLAIREMONT VILLAGE



NEIGHBORHOOD DEVELOPMENT PERMIT
CLAIREMONT VILLAGE

LEGEND

ITEM	SYMBOL
EXISTING BUILDING	
EXISTING WALL	
EXISTING DOMESTIC WATER LINE	W
EXISTING FIRE SERVICE LINE	F
EXISTING SANITARY SEWER	S
EXISTING STORM DRAIN LINE	SD
EXISTING ELECTRICAL LINE	E
EXISTING GAS LINE	G
EXISTING TELECOMMUNICATION LINE	T
EXISTING FIBER OPTIC LINE	F/O
EXISTING CONCRETE PAVEMENT	
EXISTING FIRE HYDRANT	
EXISTING POWER POLE	
EXISTING STREET LIGHT	
EXISTING CONTOUR	312
EXISTING EASEMENT	
EXISTING TREE	
PROPERTY LINE	P/L
RIGHT-OF-WAY LINE	R/W
PROPOSED CONTOUR	312
PROPOSED FIRE SERVICE	FS
PROPOSED WATER LATERAL	W
PROPOSED SEWER LATERAL	S



VICINITY MAP
NO SCALE

ENGINEER OF WORK/ APPLICANT
NOVA ENGINEERING
4373 VIEWRIDGE AVENUE
SAN DIEGO, CA. 92123 PHONE:
(619)-296-1010

MELLOR R. LANDY

ARCHITECT:
AO ARCHITECTS
144 NORTH ORANGE STREET
ORANGE, CA. 92866
PHONE: (714)-639-9860

OWNER:
CLAIREMONT VILLAGE QUAD, LLC
KLEEGE ENTERPRISES
12625 HIGH BLUFF DRIVE, SUITE 310
SAN DIEGO, CA 92130
PHONE: (858)-481-3081

BRUCE KLEEGE

PROJECT NAME: CLAIREMONT VILLAGE

SHEET TITLE: POST-DEVELOPMENT DRAINAGE CONDITIONS

DATE PREPARED: SEPTEMBER 9, 2021

NOVA
NOVA ENGINEERING
4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123
(619) 296-1010
JOB NO. XXXX

NO.	DATE	REVISION
1		
2		
3		

SHEET 2 OF 2

C-2

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Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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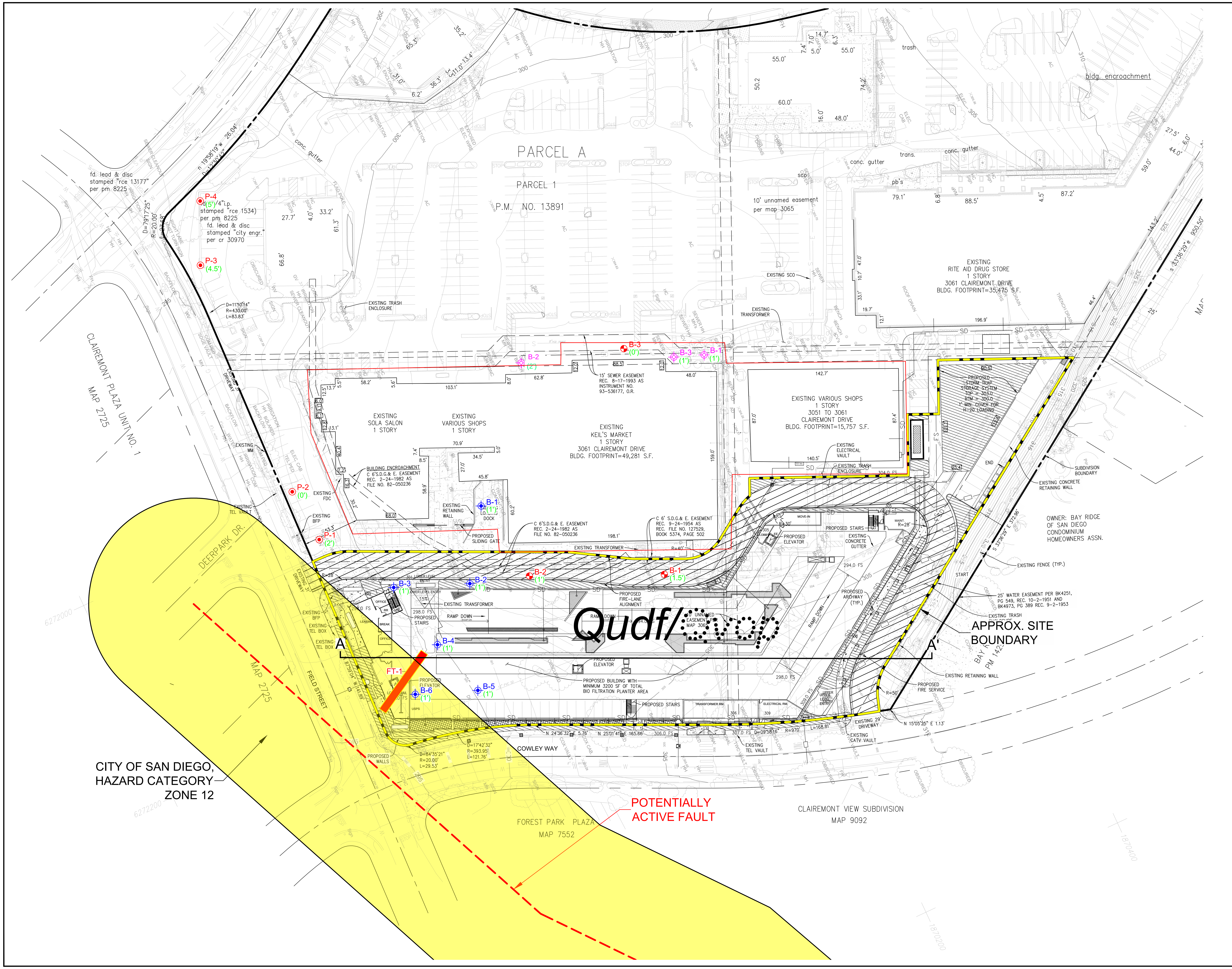

GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL

Qvop ....VERY OLD PARALIC DEPOSITS (Dotted Where Buried)

P-4 B-3 ....APPROX. LOCATION OF EXPLORATORY BORING (Geocon, 07-27-2016 Report)

B-6 ....APPROX. LOCATION OF EXPLORATORY BORING (Geocon, 12-12-1990 Report)

B-3 ....APPROX. LOCATION OF EXPLORATORY BORING (Geocon, 11-13-1990 Report)

(5') ....APPROX. DEPTH TO FORMATION (In Feet)

A A' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

FT-1 ....APPROX. LOCATION OF FAULT TRENCH

GEOLOGIC MAP

CLAIREMONT VILLAGE NDP
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 40'
DATE	00 - 00 - 0000
PROJECT NO.	G1992 - 52 - 03
FIGURE	1
SHEET	1 OF 1