County of San Diego

Stormwater Quality Management Plan (SWQMP)

For Priority Development Projects (PDPs)

Use for all PDPs (see Storm Water Intake Form, Part 4)

Priority Development Project

Project Information		Development type ☐ New development ☐ Redevelopment
Project Name	Chabad RSF	
Project Address	14906 Via De La Valle, Rancho S. Fe, CA 92067 USA	
Assessor's Parcel # (APN)	302-110-29 and 30	
Permit # / Record ID	PDS2023-MUP-23-013	
Project category (select one)	☒ Commercial	☐ Minor subdivision*
	☐ Industrial	☐ Major subdivision*
	☐ Single family residential lot	☐ Multi-family residential*
	*If residential, is a Homeowners Association (HOA) proposed? ☐ Yes ☐ No	

Project Applicant / Project Proponent		
Name	Chabad Jewish Center of RSF	
Address	14906 Via De La Valle, Rancho S. Fe, CA 92067 USA	
Phone	858-756-7571	**Email:**

SWQMP Preparer		
Name	Michael D. Schweitzer	
Company (if applicable)	SWS Engineering Inc.	
Address	1635 Lake San Marcos Dr. San Marcos, CA 92078	
Phone	760-744-0011	**Email:** michael@sws-engr.com
PE Number (if applicable)	59658	

Preparer's Certification

I understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the County of San Diego BMP Design Manual. The BMP Design Manual is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100) requirements for storm water management.

This SWQMP is intended to comply with applicable requirements of the BMP Design Manual. I certify that it has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this SWQMP by County staff is confined to a review and does not relieve me as the person in charge of overseeing the selection and design of storm water BMPs for this project, of my responsibilities for project design.

Signature  **Date** 9/10/2025

COUNTY ACCEPTED

SWQMP Approved By: *Approval Date*:

**** NOTE* Approval does not constitute compliance with regulatory requirements.***

Scope of SWQMP Submittal (Required)

Select the option that describes the scope of this SWQMP Submittal. Document your selection as indicated.

SWQMP Scope	Required Documentation
☒ ***a. SWQMP addresses the entire project***	No additional documentation.
☐ ***b. SWQMP implements requirements of an earlier master SWQMP submittal***	Include a copy of the previous submittal as **Attachment 4**.
☐ ***c. First of multiple SWQMP submittals***	Identify below the elements addressed in this submittal and in future submittals.

(1) Elements addressed in current submittal (streets, common areas, first project phase, etc.):

(2) Elements to be addressed in future submittal(s) (individual lots, future project phases, etc.):

Submittal Record: List the dates of SWQMP and plan submittals and updates. Briefly describe key changes from previous versions. If responding to plan check comments, note this in the entry and attach the responses as applicable.

No.	Date	Summary of Changes
Preliminary Design / Planning / CEQA		
1	9/14/2023	Initial Submittal
2	4/6/2024	2nd Submittal
3	5/19/2025	3rd Sugmittal
	9/9/2025	4th Submittal
Final Design		
1		Initial Submittal
2		
3		
Plan Changes		
1		Initial Submittal
2		
3		

General Directions

Note: These directions may be omitted from the print version of the SWQMP submittal.

① Scope of SWQMP Submittal and Submittal Record (inside front cover)

Use the ***Submittal Scope*** table to document the scope of activities covered under this SWQMP Form. Select one of the three options presented.

- ***SWQMP addresses the entire project***. If this SWQMP form addresses the entire project from start to finish, additional documentation of the project scope is not required.
- ***SWQMP implements requirements of an earlier master SWQMP submittal***. If this SWQMP Form implements requirements identified in an earlier master SWQMP Form, documentation of those earlier requirements must be provided. Include a copy of the previous submittal as **Attachment 4**.
- ***First of multiple SWQMP submittals***. If this is the first of multiple SWQMP submittals, use the spaces provided under Part c to identify and briefly describe which project elements are addressed in this submittal and which ones will be addressed in future submittals. For example, this PDP addresses only streets and roads, but individual lots will be documented in future submittals.

Use the ***Submittal Record*** table to list the dates of any updates to the SWQMP or construction plans. Briefly describe key changes from previous versions. If responding to plan check comments, note this in the entry and attach the responses as applicable.

② PDP SWQMP Submittal Checklist

The checklist on Page 1 summarizes the tables and attachments to be included with this PDP SWQMP submittal. It should be filled out after completing the remainder of the form. Tables and attachments with boxes already checked (☒) are required for all projects. All tables are required. The applicability of attachments not already checked will be identified during the completion of this form.

③ Attachment 1: Stormwater Intake Form

Submit a copy of your completed ***Storm Water Intake Form*** as **Attachment 1**.

④ Tables 1, 2, and 3: Baseline Site Design and Source Control BMPs

Table 1 Completion: Complete **Table 1** to document existing and proposed site features and the BMPs to be implemented for them. All BMPs must be implemented ***where applicable and feasible***. Applicability is generally assumed if a feature exists or is proposed.

Table 2 Completion: Table 2 is not required for Small Residential Projects. Applicants should check the box at the top of the table to confirm it does not apply.

> *Small Residential Projects* are those requiring *either:* a Building Permit, Minor Residential Grading Permit, or Site Plan Permit for a single family home; *or* a Tentative Parcel Map Permit for up to 4 single family homes and a remainder parcel.

All other projects must complete **Table 2** to identify applicable requirements for documenting pollutant-generating sources/ features and source control BMPs.

BMPs must be implemented for **Table 1** and **2** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in **Table 3**. Tables 1 and 2 both provide specific instructions on when explanations are required.

⑤ Attachment 5: Existing Site and Drainage Description

Complete **Attachment 5** to provide a description of (1) the existing pre-development condition of the site, and (2) existing and proposed drainage conditions for the site. If required, include a copy of the site Drainage Study with Attachment 5.

⑥ Structural Performance Standards

Determine which Structural Performance Standards apply to the PDP, where they apply, and which compliance strategies you will use to satisfy them. Record your selections in **Table 4** as follows.

Table 4, Part A.1, Selection of Standards: First select the standards that apply to the project.

- *Pollutant control plus hydromodification* — Select if the PDP is not exempt from hydromodification management requirements. It must satisfy both the Pollutant Control Performance Standard (BMPDM Section 2.2) and the Hydromodification Management Performance Standard (BMPDM Section 2.3).
- *Pollutant control only* — Select if the PDP is exempt from hydromodification management requirements per BMPDM Section 6.1. Document the exemption in **Attachment 9**.

Table 4, Part A.2, Application of Standards: Next indicate where on the site the standards apply.

- If this is a **New Development Project**, the standards apply to all impervious surfaces on the site.
- If this is a **Redevelopment Project**, their applicability will depend on the ratio of created or replaced impervious areas to existing impervious areas (see BMPDM Section 1.7). Complete the calculations in the table to determine your obligation. The **percent (%) impervious created or replaced (c)** is determined by dividing the **impervious area created or replaced (b)** by the **existing impervious area (a)** and multiplying the result by 100.
  - **If c is 50% or more**: The standards apply to all impervious surfaces on the site (a + b).
  - **If c is less than 50%**: The standards apply only to created or replaced impervious surfaces (b only).

Table 4, Part B.1: Summary of Required Attachments (1 through 5)

Use this part of the table to summarize which of Attachments 1 through 5 will be included with the SWQMP submittal. If you are completing an **electronic version** of this form, your selections will be automatically recorded based on your previous input. If you are completing a **hard copy** of this form, you must manually select Attachments 3 and 4 as applicable (see pages 4 and 6). Note that Attachments 1,2, and 5 are required for all projects.

Table 4, Part B.2: Selection of Compliance Strategies

Complete Part B.2 to document which compliance options will be used to satisfy the applicable standards for the site. Before doing so, you must determine which option will be used for each DMA. The following four potential design options are presented in detail in BMPDM Chapters 5 and 6.

1. **Self-mitigating DMAs** (BMPDM Section 5.2.1)
2. **De Minimis DMAs** (BMPDM Section 5.2.2)
3. **Self-retaining DMAs** (BMPDM Section 5.2.3)
4. **Structural BMPs**
   - Pollutant Control BMPs (BMPDM Sections 5.4)
   - Hydromodification BMPs (BMPDM Chapter 6)
   - Alternative Compliance Project (BMPDM Section 1.8)

Only one compliance option may be used per individual DMA. Regardless of which option is selected for any DMA, it must fully satisfy the applicable standard(s) determined in Part A.1.

On the left side of Part B, check the applicable boxes for each compliance option to be used.

⑦ Summary of Additional Required Attachments (6 through 12)

You must complete and submit each attachment identified for the compliance options selected. Applicable attachments are listed to the right of each compliance option. If you are completing an **electronic version** of this form, the required attachments for each design option will automatically be selected when you choose the compliance option. As noted above, these selections will also be recorded on the PDP SWQMP Submittal Checklist (Page 1). If you are completing a **hard copy** of this form, you will need to manually check the boxes for each applicable attachment on both pages.

Note that Attachment 9 (Critical Coarse Sediment Yield Areas) is required for all PDPs. If the PDP is exempt from hydromodification requirements, the exemption must be documented in Attachment 9.

⑧ Table 5: Critical Coarse Sediment Yield Area Requirements

Complete **Table 5** to select a compliance pathway for addressing Critical Coarse Sediment Yield Area (CCSYA) requirements for the PDP. See BMPDM Appendix H for additional description of requirements and options. Document Table 5 selections, including hydromodification management exemptions, in **Attachment 9**.

⑨ Tables 6 and 7: Temporary Construction Phase BMPs

Complete **Table 6** to document the minimum construction BMPs to be implemented for the project. Each BMP must be implemented ***where applicable and feasible***. At least one BMP must be selected for each construction activity listed in the table (except Erosion Control for Disturbed Slopes, which requires one BMP per season).

If applicable, use **Table 7** to describe why BMPs not selected in Table 6 are either infeasible or are only partially feasible. Justifications must be provided for all construction activity types for which NO BMPs were selected. If requested by County staff, also justify why specific individual BMPs were not selected.

⑩ Attachment 2: DMA Exhibits and Construction Plans

Exhibits and construction plan sets incorporating all applicable site features, activities, and BMPs identified in **Tables 1, 2, and 6** must be submitted as **Attachment 2 (DMA Exhibits and Construction Plan Sheets)**. See the Attachment 2 cover sheet for additional instructions.

PDP SWQMP Submittal Checklist

SWQMP Tables: All of the tables below must be completed.

☒ Table 1: Baseline BMPs for Existing and Proposed Site Features ..... Page 2

☒ Table 2: Baseline BMPs for Pollutant-generating Sources ..... Page 3

☒ Table 3: Explanations and Justifications for Table 1 and 2 Baseline BMPs ..... Page 4

☒ Table 4: DMA Structural Compliance Strategies and Documentation ..... Page 5

☒ Table 5: Critical Coarse Sediment Yield Area (CCSYA) Requirements ..... Page 6

☒ Table 6: Minimum Construction Stormwater BMPs ..... Page 7

☒ Table 7: Explanations and Justifications for Construction Phase BMPs ..... Page 8

SWQMP Attachments[1]: Use the checklist below to identify which attachments will be included with this submittal. Attachments with boxes already checked (☒) are required for all projects. The applicability of other attachments will be determined upon completing this form.

☒ Attachment 1: Storm Water Intake Form

☒ Attachment 2: DMA Exhibits and Construction Plan Sheets

☐ Attachment 3: Reserved for Future Use

☐ Attachment 4: Previous SWQMP Submittals

☒ Attachment 5: Existing Site and Drainage Description

☐ Attachment 6: Documentation of DMAs without Structural BMPs

☒ Attachment 7: Documentation of DMAs with Structural Pollutant Control BMPs

☒ Attachment 8: Documentation of DMAs with Structural Hydromodification Management BMPs

☒ Attachment 9: Management of Critical Coarse Sediment Yield Areas

☐ Attachment 10: BMP Installation Verification Form

☐ Attachment 11: BMP Maintenance Agreements and Plans

☐ Attachment 12: Documentation of Alternative Compliance Projects (ACPs)

After completing the remainder of this form, check the applicable SWQMP Attachment boxes to summarize your selections.

[1] All SWQMP Attachments are available at www.sandiego.gov/stormwater under the Development Resources tab, Submittal Templates.

Table 1 – Baseline BMPs for Existing and Proposed Site Features

A. BMPs for Existing Natural Site Features (See Fact Sheet BL-1)

1. Check the boxes below for each existing feature on the site.

2. Select the BMPs to be implemented for each identified feature. Explain why any BMP not selected is infeasible in Table 3.

	Conserve natural features (SD-G)	Provide buffers around waterbodies (SD-H)
☐ Natural waterbodies	☐	☐
☐ Natural storage reservoirs & drainage corridors	☐	---
☒ Natural areas, soils, & vegetation (incl. trees)	☒	---

B. BMPs for Common Impervious Outdoor Site Features (See Fact Sheet BL-2)

1. Check the boxes below for each proposed feature.

*2. Select the BMPs to be implemented for each proposed feature. If neither BMP **SD-B** nor **SD-I** is selected for a feature, explain why both BMPs are infeasible in Table 3.*

	a. Direct runoff to pervious areas (SD-B)	b. Construct surfaces from permeable materials (SD-I)	c. Minimize the size of impervious areas
☐ Streets and roads	☐	☐	☒ *Check this box to confirm that all impervious areas on the site will be minimized where feasible.*
☒ Sidewalks & walkways	☐	☐	
☒ Parking areas & lots	☐	☐	
☒ Driveways	☐	☐	*If this box is not checked, identify the surfaces that cannot be minimized in Table 3, and explain why it is infeasible to do so.*
☒ Patios, decks, & courtyards	☒	☐	
☐ Hardcourt recreation areas	☐	☐	
☐ Other:	☐	☐	

C. ☒ **BMPs for Rooftop Areas:** *Check this box if rooftop areas are proposed and select at least one BMP below.* **(See Fact Sheet BL-3)**

If no BMPs are selected, explain why they are infeasible in Table 3.

1. Direct runoff to pervious areas (SD-B)	2. Install green roofs (SD-C)	3. Install rain barrels (SD-E)
☒	☐	☐

D. ☒ **BMPs for Landscaped Areas:** *Check this box if landscaping is proposed and select at least one BMP below.* **(See Fact Sheet BL-4)**

If no BMPs are selected, explain why they are infeasible in Table 3.

1. Sustainable Landscaping (SD-K)
☒

Note: All features and BMPs must be shown on applicable construction plans. See applicable Fact Sheets in Appendix C of the BMP Design Manual for additional information.

Note: Use Table 3 to explain BMP infeasibility or inapplicability, or to describe features or BMPs not listed in this table. Additional explanation may be required by the County.

Table 2 – Baseline BMPs for Pollutant-generating Sources

☐ If this is a **Small Residential Project**, check this box and skip the rest of this table.

A. Management of Stormwater Discharges

1. Identify all proposed outdoor work areas below (☐ *Check here if none are proposed*)	**2. Which BMPs will be used to prevent materials from contacting rainfall or runoff?** (See Fact Sheet BL-5) *(Select all feasible BMPs for each work area[2])*			**3. Where will runoff from the work area be routed?** (See Fact Sheet BL-6) *(Select one or more option for each work area)*			
	Overhead covering (rooftops, etc.) (SC-A)	**Separation of flows from adjacent areas (berms, etc.) (SC-B)**	**Wind protection (screens, etc.) (SC-C)**	**Sanitary sewer[3] (SC-D)**	**Containment system (SC-E)**	**Stormwater S-BMP or SSD-BMP[4]**	**Other[5]**
☒ Trash & Refuse Storage	☒	☐	☐	☐	☐	☐	☐
☐ Materials & Equipment Storage	☐	☐	☐	☐	☐	☐	☐
☐ Loading & Unloading	☐	☐	---	☐	☐	☐	☐
☐ Fueling	☐	☐	---	☐	☐	☐	☐
☐ Maintenance & Repair	☐	☐	---	☐	☐	☐	☐
☐ Vehicle & Equipment Cleaning	☐	☐	---	☐	☐	☐	☐
☐ Other:	☐	☐	---	☐	☐	☐	☐

B. Prevention of Non-stormwater Discharges (See Fact Sheet BL-7)

Select one option for each feature below:

- **Storm drain inlets and catch basins …** ☐ are not proposed ☒ will be labeled with stenciling or signage to discourage dumping **(SC-F)**
- **Educational BMP Signage …** ☒ are not proposed ☐ will be labeled with educational signage for BMP **(SC-G)**
- **Interior work surfaces, floor drains, & sumps …** ☒ are not proposed ☐ will not discharge directly or indirectly to the MS4 or receiving waters
- **Drain lines (e.g., air conditioning, boiler, etc.) …** ☐ are not proposed ☒ will not discharge directly or indirectly to the MS4 or receiving waters
- **Fire sprinkler test water …** ☐ are not proposed ☒ will not discharge directly or indirectly to the MS4 or receiving waters

Note: All outdoor features and BMPs in this table must be shown on applicable construction plans. See applicable Fact Sheets in Appendix C of the BMP Design Manual for additional information. **Note:** Use Table 3 to explain BMP infeasibility or inapplicability, or to describe features or BMPs not listed in this table. Additional explanation may be required by the County.

[2] Each BMP is required where feasible. If none are selected for any feature, explain why they are infeasible in Table 3.

[3] Separate wastewater agency approvals may be required.

[4] Structural Treatment Control BMPs (S-BMPs) and Significant Site Design BMPs (SSD-BMPs) may not receive discharges from work areas that concentrate pollutants in a manner that will impair their functioning. Discharges from the proposed work area must also be included in DCV calculations for the applicable BMP.

[5] Describe other proposed options for managing stormwater discharges in Table 3.

Table 3 – Explanations and Justifications for Table 1 and 2 Baseline BMPs

☐ **Check here if no explanations or justifications for Table 1 or 2 BMPs are required.**

- **Required Justifications**: Provide explanations of BMP inapplicability and/or infeasibility as indicated per Tables 1 and 2.
- **If Requested**: Justify why specific BMPs will not be implemented or will only be partially implemented.
- **Additional Explanation**: Describe any proposed features and/or BMPs not listed in Tables 1 or 2.

BMP-Feature Combination		Explanation
Feature	Landscaped Areas	In coordination with Landscape
BMP	SD-K	
Feature	Proprietary Biofiltration (MWS)	In coordination with Landscape
BMP	BF-3	
Feature		
BMP		
Feature		
BMP		
Feature		
BMP		
Feature		
BMP		
Feature		
BMP		

Table 4: DMA Structural Compliance Strategies and Documentation

Part A – Selection and Application Structural Performance Standards

1. Selection of Standards (select one; see BMPDM Section 6.1)

☐ a. Pollutant control + hydromodification ☐ b. Pollutant control only (project is exempt from hydromodification requirements)

2. Application of Structural Performance Standards (select one; see BMPDM Section 1.7)

☐ **New Development Projects:** Standards apply to all impervious surfaces.

☒ **Redevelopment Projects:** Complete the calculations below. Select the applicable scenario based on the results.

a. Existing impervious area (ft²)	b. Impervious area created / replaced (ft²)	c. % Impervious created / replaced [(b/a)*100]
65,969	69,303	105%

☒ *Scenario 1: c is 50% or more*: Performance standards apply to all impervious surfaces (a + b).

☐ *Scenario 2: c is less than 50%*: Performance standards apply only to created or replaced impervious surfaces (b only).

Part B – Compliance Strategies and Required Attachments

1.*Complete and submit each of the applicable attachments on the right.*

Att. 1	Att. 2	Att. 3	Att. 4	Att. 5
Storm Water Intake Form ☒	DMA Exhibits and Construction Plan Sheets ☒	N/A ☐	Previous SWQMP Submittals (see inside cover) ☐	Existing Site and Drainage Description ☒

2. *Indicate each compliance strategy below that will be used for one or more DMAs on the site.*

	Att. 6 DMAs without Structural BMPs	Att. 7 DMAs w/ Structural Pollutant Control BMPs	Att. 8 DMAs w/ Structural Hydromod. BMPs	Att. 9 Critical Coarse Sediment Yield Areas	Att. 10 BMP Installation Verification Form	Att. 11 Maintenance Agreements/ Plans	Att. 12 Alternative Compliance Projects
☒Self-mitigating DMAs (BMPDM Section 5.2.1)	☒			☒			
☐De Minimis DMAs (BMPDM Section 5.2.2)	☐			☐			
☐Self-retaining DMAs (BMPDM Section 5.2.3)	☐			☐	☐		
Structural BMPs (select all that apply)							
☒Pollutant Control BMPs (BMPDM Section 5.4)		☒		☒	☒	☒	
☒Hydromodification Control BMPs (BMPDM Chapter 6)			☒	☒	☒	☒	
☐Alternative Compliance Project (BMPDM Section 1.8)				☐	☐	☐	☐

- *Attachments 1, 2, and 5 are required for all projects.*

Table 5: Critical Coarse Sediment Yield Area (CCSYA) Requirements

- Identify one applicable compliance pathway for the PDP below.
- Document your selection in **Attachment 9**.

A. Hydromodification Management Exemption (BMPDM Sections 1.6 and 6.1)

☐ **PDP is Exempt from Hydromodification Management Requirements**

Select if hydromodification management exemption was selected in Table 4 Part A.1.

B. Watershed Management Area (WMAA) Mapping (BMPDM Appendix H.1.1.2)

☒ **WMAA mapping demonstrates the following:**

a. <5% of potential onsite CCYSAs will be impacted (built on or obstructed)

b. All potential upstream offsite CCYSAs will be bypassed

C. Resource Protection Ordinance (RPO) Methods (BMPDM Appendix H.1.1.1)

☐ **RPO Scenario 1: PDP is subject to and in compliance with RPO requirements**

a. Project requires one or more discretionary permits (RPO applicability is confirmed during discretionary review)

b. Onsite AND upstream offsite CCSYAs will be avoided and/or bypassed

☐ **RPO Scenario 2: PDP is entirely exempt/not subject to RPO requirements**[6]

a. Project does not require discretionary permits

b. Project will bypass all upstream offsite CCSYAs (no requirements for onsite CCSYAs)

D. No Net Impact Analysis (BMPDM Appendix H.4)

☐ **Project demonstrates no net impact to receiving waters**

[6] Does not include PDPs utilizing exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3).

Table 6 –Minimum Construction Stormwater BMPs

Minimum Required BMPs by Activity Type Select all applicable activities and at least one BMP for each.	References Caltrans[7]	 County of San Diego
☒ **Erosion Control for Disturbed Slopes** (choose at least 1 per season)		
☒ Vegetation Stabilization Planting[8] (Summer)	SS-2, SS-4	
☐ Hydraulic Stabilization Hydroseeding (Summer)	SS-4	
☐ Bonded Fiber Matrix or Stabilized Fiber Matrix[9] (Winter)	SS-3	
☐ Physical Stabilization Erosion Control Blanket (Winter)	SS-7	
☒ **Erosion control for disturbed flat areas (slope < 5%)**		
☒ County Standard Lot Perimeter Protection Detail	SC-2	PDS 659[10]
☐ Use of Item A erosion control measures on flat areas	SS-3, SS-4, SS-7	
☐ County Standard Desilting Basin (must treat all site runoff)	SC-2	PDS 660[11]
☐ Mulch, straw, wood chips, soil application	SS-6, SS-8	
☒ **Energy dissipation (required to control velocity for concentrated runoff or dewatering discharge)**		
☒ Energy Dissipater Outlet Protection	SS-10	RSD D-40[12]
☒ **Sediment control for all disturbed areas**		
☒ Silt Fence	SC-1	
☒ Fiber Rolls (Straw Wattles)	SC-5	
☒ Gravel & Sand Bags	SC-6, SC-8	
☐ Dewatering Filtration	NS-2	
☒ Storm Drain Inlet Protection	SC-10	
☐ Engineered Desilting Basin (sized for 10-year flow)	SC-2	
☒ **Preventing offsite tracking of sediment**		
☒ Stabilized Construction Entrance	TC-1	
☐ Construction Road Stabilization	TC-2	
☐ Entrance/Exit Tire Wash	TC-3	
☒ Entrance/Exit Inspection & Cleaning Facility	TC-1	
☐ Street Sweeping and Vacuuming	SC-7	
☒ **Materials Management**		
☒ Material Delivery & Storage	WM-1	
☒ Spill Prevention and Control	WM-4	
☒ **Waste Management[13]**		
☒ Waste Management Concrete Waste Management	WM-8	
☒ Solid Waste Management	WM-5	
☒ Sanitary Waste Management	WM-9	
☒ Hazardous Waste Management	WM-6	

[7] See Caltrans 2017 Construction Site Best Management Practices (BMP) Manual available at: https://dot.ca.gov/programs/construction/storm-water-and-water-pollution-control/manuals-and-handbooks
[8] Planting or Hydroseeding may be installed between May 1st and August 15th. Slope irrigation must be in place and operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. A contingency physical BMP must be implemented by August 15th if vegetation is not established by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.
[9] All slopes over three feet must have established vegetative cover prior to final permit approval.
[10] County PDS 659. Standard Lot Perimeter Protection Design System (Bldg. Division)
[11] County PDS 660. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Bldg. Division
[12] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater (also acceptable for velocity reduction)
[13] Applicants are responsible to apply appropriate BMPs for specific wastes (e.g., BMP WM-8 for concrete).

Table 7 – Explanations and Justifications for Construction Phase BMPs

☒ **Check here if no explanations or justifications for Table 6 BMPs are required.**		
Justifications for Table 6 Temporary Construction Phase BMPs • **Required Justifications**: Justify all construction activity types for which NO BMPs were selected. • **If Requested**: Justify why specific individual BMPs were not selected. • **Additional Explanation**: Describe any proposed features and/or BMPs not listed in Table 6.		
Activity Type / BMP		**Explanation**
Activity Type		
BMP		
Activity Type		
BMP		
Activity Type		
BMP		
Activity Type		
BMP		
Activity Type		
BMP		
Activity Type		
BMP		
Activity Type		
BMP		

County of San Diego
Stormwater Quality Management Plan (SWQMP)
Attachment 1: Storm Water Intake Form for All Permit Applications

This form establishes Stormwater Quality Management Plan (SWQMP) requirements for Development Projects per Sections 67.809 and 67.811 of the County of San Diego Watershed Protection Ordinance (WPO). See ***Storm Water Intake Form Instructions*** for additional guidance and explanation of terms.

Part 1. Project Information	
Project Name:	Chabad RSF
Record ID (Permit) No(s):	PDS2023-MUP-23-013
Assessor's Parcel No(s):	302-110-29 and 30
Street Address (or Intersection):	14906 Via De La
City, State, Zip:	Del Mar, CA 92067

Part 2. Applicant / Project Proponent Information	
Name:	Chabad Jewish Center of RSF
Company:	
Street Address:	14906 Via De La Valle
City, State, Zip:	Rancho S. Fe, CA 92067
Phone Number	858-756-7571
Email:	

Part 3. Required Information for All Development Projects

Ⓐ **1. Existing (pre-development) impervious surfaces (ft²)**	**2. Created or replaced impervious surfaces (ft²)**	**3. Total disturbed area (acres or ft²)**
65,969	69,303	2.39 ac

Ⓑ ☐ Check here and provide a WDID# if this project is subject to the California Construction General Permit (Order No. 2009-0009-DWQ)[1]	**WDID # (if issued)**

For County Use Only	**Reviewed By:**	**Review Date:**
☐ Standard SWQMP	☐ PDP SWQMP	☐ Green Streets PDP Exemption SWQMP

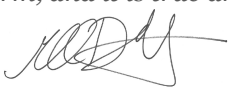
[1] Available at: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.html

Part 4. Priority Classification & SWQMP Form Selection

(A) *If your project is the following … (select one)*	(B) *You must complete …*
☐ **Standard Project** ☐ a. Project is East of the Pacific/Salton Sea Divide ☐ b. None of the PDP criteria below applies	➔ **Standard *SWQMP Form***
☒ **Priority Development Project (PDP)** ☐ 1. Project is part of an existing PDP**,** OR ☐ 2. Project does any of the following: ☒ a. Creates or replaces a total of 10,000 ft² or more of impervious surface ☒ b. Creates or replaces a combined total of 5,000 ft² or more of impervious surface within one or more of the following uses: (1) parking lots; (2) streets, roads, highways, freeways, and/or driveways; (3) restaurants; and (4) hillsides ☐ c. Creates or replaces a combined total of 5,000 ft² or more of impervious surface within one or more of the following uses: (1) automotive repair shops; and (2) retail gasoline outlets ☐ d. Discharges directly to an Environmentally Sensitive Area (ESA) AND creates or replaces 2,500 ft² or more of impervious surface ☒ e. Disturbs one or more acres of land (43,560 ft²) and is expected to generate pollutants post-construction ☒ f. Is a redevelopment project that creates or replaces 5,000 ft² or more of impervious surface on a site already having at least 10,000 ft² of impervious surface	➔ **PDP *SWQMP Form***
☐ **Green Streets PDP Exemption**[2]	➔ **Green *Streets PDP Exemption SWQMP Form***

Part 5. Applicant Signature

I have reviewed the information in this form, and it is true and correct to the best of my knowledge.

Applicant / Project Proponent Signature:  Date: 9/9/25

- ***Upon completion*** *submit this form to the County.*
- ***If requested****, attach supporting documentation to justify selections made or exemptions claimed.*
- ***If this is a PDP that is part of a larger existing PDP****, you will be required to attach a copy of the existing SWQMP to the newer SWQMP submittal.*

[2] ***Green Streets PDP Exemption Projects*** are those claiming exemption from PDP classification per WPO Section 67.811(b)(2) because they consist exclusively of *either* 1) development of new sidewalks, bike lanes, and/or trails; *or* 2) improvements to existing roads, sidewalks, bike lanes, and/or trails.

2.0 General Requirements

- Attachment 2 consolidates exhibits and plans required for the entire project.
- Complete the table below to indicate which sub-attachments are included with the submittal. Sub-attachments that are not applicable can be excluded from the submittal.
- Unless otherwise stated, features and BMPs identified and described in each corresponding Attachment (6 through 9) must be shown on applicable DMA Exhibits and construction plans submitted for the project.

Sub-attachments	Requirement
☒ **2.1: DMA Exhibits**	All PDPs
☒ **2.2: Individual Structural BMP DMA Mapbook**	PDPs with structural BMPs
☒ **2.3: Construction Plan Sets**	All projects

2.1 DMA Exhibits

- DMA Exhibits must show all DMAs on the project site. Exhibits must include all applicable features identified in applicable SWQMP attachments.
- Exhibits may be prepared individually for the BMPs associated with each applicable SWQMP Attachment (6, 7, 8, and/or 9) or combined into one or more consolidated exhibits.
- Use this checklist to ensure required information is included on each exhibit (copy as needed).

DMA Exhibit ID #:	
A. Features required for all exhibits	
1. Existing Site Features	
☒ Underlying hydrologic soil group (A, B, C, D)	☒ Topography and impervious areas
☒ Approximate depth to groundwater	☒ Existing drainage network, directions, and offsite connections
☐ Natural hydrologic features	
2. Drainage Management Area (DMA) Information	
☒ Proposed drainage network, directions, and offsite connections	☒ DMA boundaries, ID numbers, areas, and type (structural BMP, de minimis, etc.)
3. Proposed Site Changes, Features, and BMPs	
☒ Proposed demolition and grading	☒ Construction BMPs[2]
☒ Group 1, 2, and 3 Features[1]	☒ Baseline source control BMPs
☒ Group 4 Features	☒ Baseline source control BMPs
B. Proposed Features and BMPs Specific to Individual SWQMP Attachments[3]	
☐ Attachment 6	☐ SSD-BMP impervious dispersion areas ☐ SSD-BMP tree wells
☒ Attachment 7	☐ Structural pollutant control BMPs
☒ Attachment 8	☒ Structural hydromodification management BMPs ☒ Point(s) of Compliance (POC) for hydromodification management ☒ Proposed drainage boundary and drainage area to each POC
☒ Attachment 9	☐ Onsite CCSYAs ☐ Bypass of onsite CCSYAs ☐ Bypass of upstream offsite CCSYAs

[1] Group 1-4 features and baseline BMPs from PDP SWQMP Tables 2 and 3.
[2] Minimum Construction Stormwater BMPs from PDP SWQMP Table 7.
[3] Identify the location, ID numbers, type, and size/detail of BMPs.

2.2 Individual Structural BMP DMA Mapbook

- Use this page as a cover sheet for the Structural DMA Mapbook.
- An individual Structural DMA Mapbook must be submitted for any project site with one or more structural BMPs. One Mapbook is required for each unique subsequent owner with responsibility for maintenance of a Structural BMP. Mapbook exhibits will be incorporated as exhibits in Stormwater Maintenance Agreements (SWMAs) and Maintenance Notifications (MNs). See Attachment 11 for additional information on maintenance agreements. If the Mapbook has been provided for each subsequent owner in Attachment 11, they are not required here.
- Place each map on 8.5"x11" paper.
- Show at a minimum the DMA, Structural BMP, Assessor's parcel boundaries with parcel numbers, and any existing hydrologic features within the DMA.

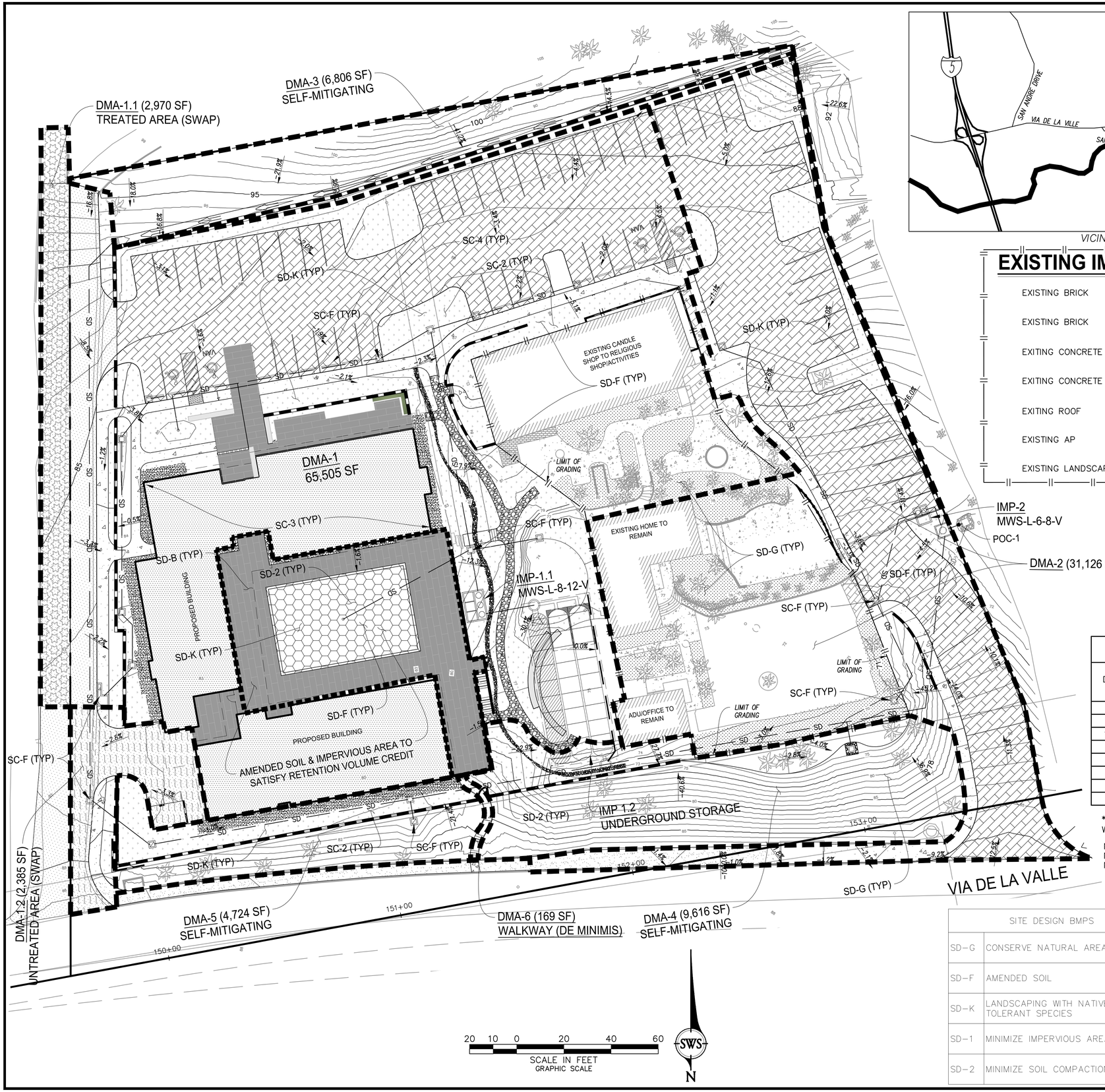
☐	All Mapbooks are attached
☐	All Mapbooks are in Attachment 11

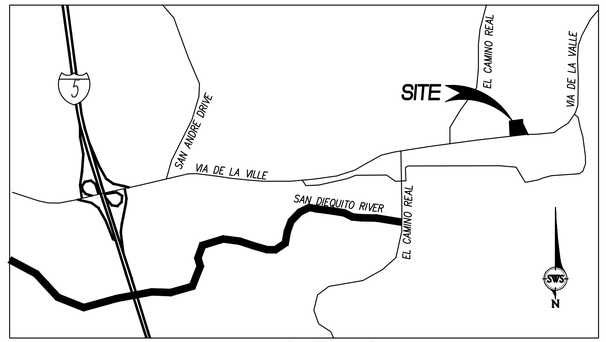
2.3 Construction Plan Sets

- DMAs, features, and BMPs identified and described in this attachment must also be shown on all applicable construction and landscape plans.
- As applicable, plan sheets must identify:
    - All features and BMPs identified in Sub-attachment 2.1 (DMA Exhibits).
    - The additional information listed below.
- Use this checklist to ensure required information is included on each plan (copy as needed).

Plan Type	
Required Information[4]	
☒ Structural BMP(s) and Significant Site Design BMPs (if applicable) with ID numbers.	
☒ 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) and Significant Site Design BMPs (if applicable).	
☒ Signage indicating the location and boundary of structural BMP(s) as required by County staff.	
☒ How to access the structural BMP(s) to inspect and perform maintenance.	
☒ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds).	
☒ 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 (if available) 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 manufacturer model number must be provided. Photocopies of general brochures are not acceptable.	
☒ Include all source control and site design measures described in the SWQMP.	
☒ Include all construction BMPs described in the SWQMP.	

[4] For Building Permit Applications, refer to Form PDS 272, https://www.sandiegocounty.gov/content/dam/sdc/pds/docs/pds272.pdf





VICINITY MAP NO SCALE

EXISTING IMPERVIOUS

- EXISTING BRICK
- EXISTING BRICK
- EXITING CONCRETE
- EXITING CONCRETE WOOD DECK
- EXITING ROOF
- EXISTING AP
- EXISTING LANDSCAPE

LEGEND

- DMA BOUNDARY
- SOIL TYPE — "D"
- GROUNDWATER TABLE — > 50'
- PROPOSED STORM DRAIN — SD
- BOUNDARY TO REMAIN UNDISTURBED
- OFFSITE DRIVEWAY BEING TREATED (SWAPPED) WITH DMA-1.2 THAT WILL NOT BE TREATED
- ONSITE DRIVEWAY/PATHWAY NOT BEING TREATED (SWAPPED) WITH DMA-1.1 THAT WILL BE TREATED
- PROPOSED LANDSCAPE AREA AMENDED SOIL FOR RETENTION VOLUME CREDIT (2,280 SF)
- PROPOSED PAVER IMPERVIOUS AREA DRAINAGE INTO AMENDED SOIL FOR RETENTION VOLUME CREDIT (4,967 SF)
- PROPOSED MULCH
- PROPOSED ROCK
- PROPOSED GRAVEL
- PROPOSED LANDSCAPE AREA
- PROPOSED PERMEABLE PAVER
- PROPOSED LIME STONE
- PROPOSED CONCRETE PAVING
- PROPOSED CONCRETE
- PROPOSED BLDG
- PROPOSED ASH

TABULAR SUMMARY OF DMAs

DMA	IMP #	AREA (SF)	IMPERVIOUS AREA (SF)	% IMP	HSG	AREA WEIGHTED RUNOFF COEFFICIENT	Q (FLOW BASED)	TREATMENT SYSTEM
1	1	65,505	49,240	75	D	0.75	0.339	MWS (BF-3)*
1.1	–	2,970	2,970	100	D	0.9		
1.2		2,385	2,385	100	D	0.9		NOT BEING TREATED (SWAP)*
2	2	31,126	24,934	80	D	0.78	0.167	MWS (BF-3)
3	–	6,806	–	0	D	0.3	–	SELF-MITIGATING
4	–	9,616	–	0	D	0.3	–	SELF-MITIGATING
5	–	4,724	–	0	D	0.3	–	SELF-MITIGATING
6	–	169	169	100	D	0.9	–	DE MINIMIS

*DMA-1.1 IS AN EXISTING OFFSITE WEST DRIVEWAY/STREET TO BE TREATED BY MWS-1 IN EXCHANGE (SWAPPED) WITH THE DMAs 1.2 (ONSITE WEST DRIVEWAY/STREET THAT CANNOT DRAIN INTO MMS FOR TREATMENT

No EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS)
No CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED
No PROPOSED DESIGN FEATURES AND SURFACE TREATMENTS USED TO MINIMIZE IMPERVIOUSNESS

SITE DESIGN BMPS	
SD-G	CONSERVE NATURAL AREAS
SD-F	AMENDED SOIL
SD-K	LANDSCAPING WITH NATIVE DROUGHT TOLERANT SPECIES
SD-1	MINIMIZE IMPERVIOUS AREA
SD-2	MINIMIZE SOIL COMPACTION

SOURCE CONTROL NOTES	
SC-A	TRASH & REFUSE STRAGE
SC-F	STENCIL ON-SITE INLETS: "NO DUMPING! FLOWS TO CREEK"
SC-2	LANDSCAPE/OUTDOOR PESTICIDE USE: PROVIDE IMP
SC-3	ROOF AND EQUIPMENT: CONNECT CONDENSATE DRAIN TO SANITARY SEWER, PROVIDE ROOFING AND/SECONDARY CONTAINMENT TO EQUIPMENT, AVOID USE OF UNPROTECTED METALS.
SC-4	PLAZAS, SIDEWALKS, AND PARKING LOTS: SWEEP REGULARY, COLLECT DEBRIS, COLLECT WASHWATER AND DISCHARGE TO SANITARY SEWER

20 10 0 20 40 60
SCALE IN FEET
GRAPHIC SCALE

N

DMA MAP (1 OF 2)

FOR

CHABAD RANCHO SANTA FE

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

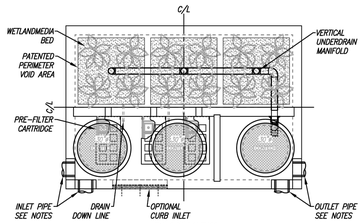
DATE:9/9/2025 11:20:24 AM BY:MASSY,FATIMA
FILE:P:\Projects\2021\21-207\PRO\Reports\SWSMP
FILE NAME:21-207_DMA Map.dwg

24" x 36"

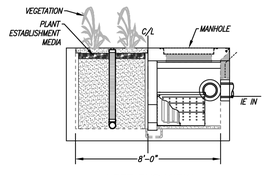
SITE SPECIFIC DATA

PROJECT NUMBER			
PROJECT NAME		Chabad Rancho Santa Fe	
PROJECT LOCATION		14906 Via De La, Ranch Santa Fe, CA	
STRUCTURE ID		IMP-1.1	
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.346
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



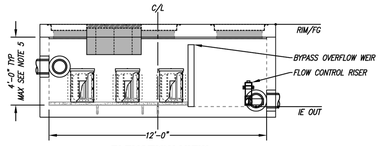
PLAN VIEW



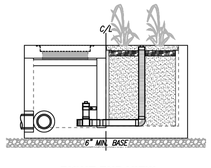
LEFT END VIEW

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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

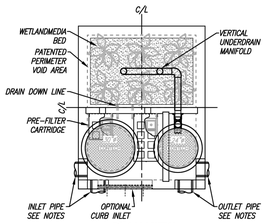
MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

IMP–1.1
PRELIMINARY MWS–L–8–12–V, TO BE DETAILED PER PROPOSED DESIGN AT FINAL ENGINEERING

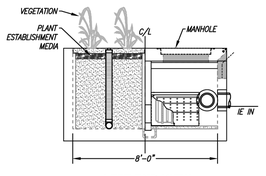
SITE SPECIFIC DATA

PROJECT NUMBER			
PROJECT NAME		Chabad Rancho Santa Fe	
PROJECT LOCATION		14906 Via De La, Rancho Santa Fe, CA	
STRUCTURE ID		IMP-2	
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.167
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



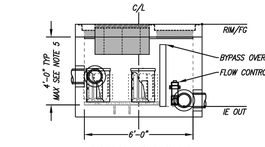
PLAN VIEW



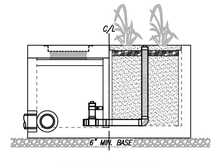
LEFT END VIEW

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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-6-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

IMP–2
PRELIMINARY MWS–L–6–8–V, TO BE DETAILED PER PROPOSED DESIGN AT FINAL ENGINEERING

ADS Advanced Drainage Systems, Inc.

ADS Dura-Core® FOR STORMTECH® MC-3500 CHAMBERS "QUICK" CAD INSERTS

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" OR CHAMBER CLASSIFICATION AS AN ENGINEERED SECTION.
4. CHAMBERS SHALL BE DESIGNED, TESTED AND INSTALLED FOR ACTUAL INSTALLED MATERIAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE CHAMBERS SHALL BE DESIGNED FOR A 75 YEAR SERVICE LIFE, FOR LIVE LOADING BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTOR CHAMBERS". CHAMBERS SHALL BE CAPABLE OF WITHSTANDING 300 PSF (14.4 kPa) MINIMUM VERTICAL UNIFORM LIVE LOAD ON MINIMUM COVER (2.4 MINIMUM PERMANENT (10 YR) COVER LOAD AND A ALLOWABLE CLOSED WITH PAVED (1.65DC), AASHTO DESIGN TRUCK.
7. CHAMBER FOUNDATION, BACKFILL AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LEGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 8".
   - TO ENSURE THAT THE CHAMBER FOOTPRINT IS FLAT AND SUPPORTS THE CHAMBER ALONG THE ENTIRE LENGTH OF THE CHAMBER, THE CHAMBER FOOTPRINT SHALL HAVE A MINIMUM 0.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 3000 LBS/FT/IN. AND SHALL NOT BE GREATER THAN OR EQUAL TO 3500 LBS/FT/IN. (AASHTO M 145 SOIL CLASSIFICATIONS A-1, A-2, A-3 OR A-4 WITH A GROUP INDEX OF 0 THROUGH 4). THE MINIMUM REQUIRED BY ASTM F2787 AND IS TO BE USED TO REPORT CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C). CHAMBERS SHALL BE PRODUCED FROM RESILIENTSE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER WILL SUBMIT A STRUCTURAL EVALUATION FOR REVIEW BY THE SITE DESIGN ENGINEER. THE EVALUATION SHALL INCLUDE THE FOLLOWING:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - A PLOT PLAN SHOWING THE LOCATION OF THE CHAMBERS AND THE ACTUAL PROPOSED TRENCH OR EXCAVATION.
   - TO 1.68 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD. THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - A PLOT PLAN SHOWING THE LOCATION OF THE CHAMBERS AND THE ACTUAL PROPOSED TRENCH OR EXCAVATION.
   - DESIGN EXCEPT THAT IT SHALL BE THE 75 YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
10. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.10 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO USE MANIFOLDS THAT ARE LARGER THAN THE CHAMBERS BEING ATTACHED TO.
11. CHAMBERS MUST NOT BE INSTALLED IN PAVED OR TRAFFIC BEARING AREAS UNTIL A FINAL PAVEMENT OR LINER SYSTEM, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTECHNICAL PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

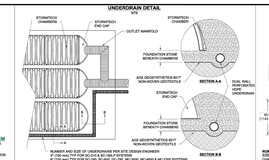
1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURERS REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS AND END CAPS MUST BE BACKFILLED WITH A STONE OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - BACKFILL AS ROWS ARE BUILT ALONG THE CHAMBER RUN
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM -6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE, WITH AN AASHTO M43 DESIGNATION OF 3, 357, 4, 467, 5, 56, 57.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SYSTEM FROM SEDIMENTATION. INSPECT AND REMOVE INSERTS AFTER CONSTRUCTION SITE IS STABILIZED.

NOTES FOR CONSTRUCTION EQUIPMENT

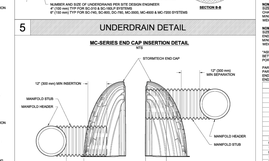
1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL DEPTH ASPHALT/CONCRETE PAVEMENT OVER CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR PARKING.

USE OF EXCAVATORS OR LOADERS TO PLACE STONE BETWEEN THE ROWS OF CHAMBERS MAY COUSE DAMAGE TO CHAMBERS, AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

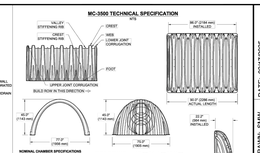


5 UNDERDRAIN DETAIL



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

6 MC-SERIES END CAP INSERTION DETAIL



NOMINAL CHAMBER SPECIFICATIONS
SIZE (W X H X INSTALLED LENGTH): 77.0" X 45.0" X 90.0" (1956 mm X 1143 mm X 2286 mm)
MINIMUM INSTALLED STORAGE*: 71.9 CUBIC FEET (2.04 m³)
WEIGHT: 134 lbs (61 kg)

NOMINAL END CAP SPECIFICATIONS
SIZE (W X H X INSTALLED LENGTH): 75.0" X 42.0" X 22.0" (1905 mm X 1143 mm X 584 mm)
END CAP STORAGE: 14.6 CUBIC FEET (0.42 m³)
MINIMUM INSTALLED STORAGE*: 86.5 CUBIC FEET (2.45 m³)
WEIGHT: 49 lbs (22 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" (152 mm) STONE BETWEEN CHAMBERS, 9" (229 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

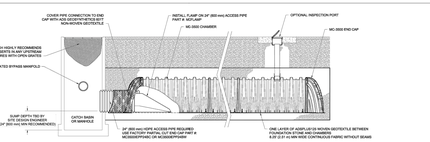
PARTIAL CUT ACCEPTABLE AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT ACCEPTABLE AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
FOR DETAILED INSTALLATION INSTRUCTIONS REFER TO "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.2" (844 mm)	0.00" (0 mm)
MC3500IEPP06TC			
MC3500IEPP08T	8" (200 mm)	31.19" (792 mm)	0.81" (21 mm)
MC3500IEPP08TC			
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	2.97" (75 mm)
MC3500IEPP10TC			
MC3500IEPP12T	12" (300 mm)	26.39" (670 mm)	5.62" (143 mm)
MC3500IEPP12TC			
MC3500IEPP15T	15" (375 mm)	22.59" (574 mm)	9.42" (239 mm)
MC3500IEPP15TC			
MC3500IEPP18T	18" (450 mm)	20.00" (508 mm)	11.99" (305 mm)
MC3500IEPP18TC			
MC3500IEPP24T	24" (600 mm)	14.49" (368 mm)	17.77" (451 mm)
MC3500IEPP24TC			
MC3500IEPP30T	30" (750 mm)	8.98" (228 mm)	23.28" (591 mm)
MC3500IEPP30TC			
MC3500IEPP36T	36" (900 mm)	—	2.79" (70 mm)
MC3500IEPP36TC			

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PARTIAL CUT INSERTS ARE AVAILABLE UPON REQUEST
FOR ECCENTRIC MANIFOLDS, CUSTOM PARTIAL CUT INSERTS FOR END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES LARGER THAN 1/2 THE CHAMBER SPAN (12" (300 mm) FOR MC-3500)
ECCENTRIC MANIFOLDS CUSTOM DESIGNED FOR 1/2 CHAMBER SPAN PIPES ARE AVAILABLE UPON REQUEST
PLEASE CONSULT STORMTECH FOR THE PIPE SIZE.

2 MC-3500 TECHNICAL SPECIFICATIONS



MC-3500 ISOLATOR ROW PLUS DETAIL

3 MC-3500 ISOLATOR ROW PLUS DETAIL



4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

4 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

INSPECTION & MAINTENANCE

STEP 1: INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A.1: INSPECTION PORTS (IF PRESENT)
  - A.1.1: REMOVE/OPEN LID ON NYLOPLAST IN-LINE DRAIN
  - A.1.2: REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.1.3: USING A FLASHLIGHT AND MEASURING STICK, DETERMINE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.1.4: LOWER A CAMERA INTO INSPECTION PORT AND RECORD IMAGES OF SEDIMENT FOR FUTURE REFERENCE (OPTIONAL)
  - A.1.5: IF SEDIMENT IS AT OR ABOVE 3" (80 mm), PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B: ALL ISOLATOR PLUS ROWS
  - B.1: USING ISOLATOR ROW PLUS STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2: USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - I. WORKING ON POLES OR CHAINING MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - II. RECORD DEPTH OF SEDIMENT AND DETERMINE IF MAINTENANCE IS REQUIRED
  - B.3: IF SEDIMENT IS AT OR ABOVE 3" (80 mm), PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2: CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A: A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° OR MORE IS PREFERRED
- B: APPLY MULTIPLE PASSES OF JETTING UNTIL WATER RETURNS IS CLEAN
- C: VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3: REPLACE ALL COVERS, GRATES, FILTERS, AND LOOSE RECORD OBSERVATIONS AND ACTIONS.

STEP 4: INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

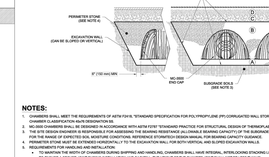
NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER D STARTS FROM THE TOP OF THE EMBEDMENT STONE (E) LAYER TO THE BOTTOM OF THE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBGRADE MAY BE PART OF THE D LAYER	ANY SOIL/ROCK MATERIAL, NATIVE SOILS OR PER ENGINEERS PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND COMPACTION REQUIREMENTS
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER C STARTS FROM THE TOP OF THE EMBEDMENT STONE (E) LAYER TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBERS. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE C LAYER	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145* A-1, A-2-4, A-3 OR AASHTO M43* 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	DESIGN COMPACTIONS AFTER 18" (450 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% RELATIVE DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE (F) LAYER(S) TO THE "C" LAYER	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE*	AASHTO M43* 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE*	AASHTO M43* 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE[1]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS FOR STONE CONSIDERATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR A STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. THE USE OF RECYCLED CONCRETE AGGREGATE (RCA) SHOULD BE EVALUATED ON A PROJECT BY PROJECT BASIS. FOR ADDITIONAL INFORMATION, REFER TO TECHNICAL NOTE 6.20.
3. WHERE GEOTEXTILES SEPARATE STONE FROM SOIL, STORMTECH RECOMMENDS NON-WOVEN GEOTEXTILE MEETING MINIMUM REQUIREMENTS FOR FLOW RATE AND PUNCTURE STRENGTH. FOR ADDITIONAL GEOTEXTILE SPECIFICATION INFORMATION, REFER TO STORMTECH DESIGN AND CONSTRUCTION EQUIPMENT. FOR SPECIAL CONDITIONS, CONTACT STORMTECH FOR ASSISTANCE.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'B' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEERS DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE (RCA) IS USED AS STONE FOUNDATION OR EMBEDMENT STONE, THE FOLLOWING PROPERTIES SHOULD MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL":



NOTES:
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS"
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS"
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE EXPECTED LOADS TO BE IMPOSED ON THE BOTTOM OF THE FOUNDATION STONE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LEGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 8".
   - TO ENSURE THAT THE CHAMBER FOOTPRINT IS FLAT AND SUPPORTS THE CHAMB

PRELIMINARY GRADING AND UTILITY PLANS FOR:

CHABAD - RANCHO SANTA FE

GRADING NOTE

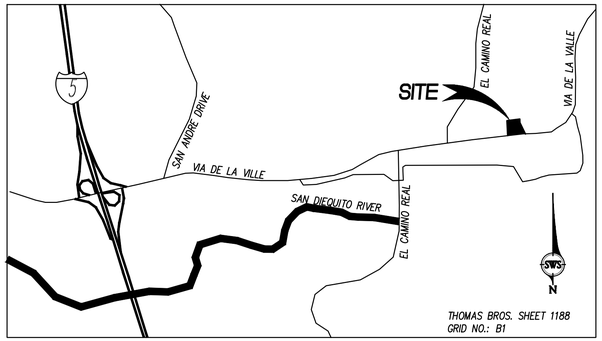
1. ALL GRADING SHALL CONFORM OF THE REQUIREMENTS OF THE GRADING ORDINANCE SECTIONS 87.101 THROUGH 87.804 OF THE SAN DIEGO COUNTY CODE OF REGULATORY ORDINANCES.
2. A REGISTERED CIVIL ENGINEER IS REQUIRED TO SUPERVISE INSTALLATION OF THE FILL KEYWAY AND ALL FILL BENCHING AND COMPACTION. A SOILS REPORT WITH COMPACTION TESTS IS REQUIRED FOR ALL FILL THAT IS OVER 12" IN DEPTH. DPLU FORM #73, MINOR GRADING CERTIFICATION, AND THREE (3) COPIES OF THE COMPACTION REPORT COMPLETED BY A SOILS ENGINEER SHALL BE SUBMITTED PRIOR TO ROUGH GRADE APPROVAL.
3. ALL FILL MATERIAL SHALL BE COMPACTED TO AT LEAST 90% MAXIMUM DRY DENSITY.
4. NATURAL DRAINAGE SHALL NOT BE DIVERTED OR CONCENTRATED ONTO ADJACENT PROPERTY.
5. MAINTAIN 1% (MINIMUM) SLOPE AWAY FROM ALL BUILDINGS FOR AT LEAST 5'.
6. ALL GRADING DETAILS SHALL BE IN CONFORMANCE WITH THE FOLLOWING SAN DIEGO COUNTY DESIGN STANDARDS OR REGIONAL STANDARD DRAWINGS:
   A. DS-8 LOT GRADING
   B. DS-10 GRADING OF SLOPES
   C. DS-11 REQUIRED SETBACKS
   D. D-40 RIP RAP ENERGY DISSIPATOR
   E. D-75 DRAINAGE DITCHES
7. BERMS SHALL BE REQUIRED AT THE TOP OF ALL FILL SLOPES AND SWALES OR BROW DITCHES SHALL BE REQUIRED AT THE TOP OF ALL CUT SLOPES. ALL BERMS, SWALES, OR BROW DITCHES SHALL CONFORM TO THE DESIGN STANDARDS OR REGIONAL STANDARD DRAWINGS LISTED ABOVE.
8. REGARDLESS OF WHICH BMP'S ARE IMPLEMENTED THE FACE OF ALL CUT AND FILL SLOPES IN EXCESS OF 3' VERTICAL HEIGHT SHALL BE PLANTED AND MAINTAINED WITH A GROUND COVER OR OTHER PLANTING TO PROTECT THE SLOPES AGAINST EROSION AND INSTABILITY. PLANTING SHALL COMMENCE AS SOON AS SLOPES ARE COMPLETED. ALL PLANTING MUST HAVE A PERMANENTLY INSTALLED IRRIGATION SYSTEM
9. REQUIRED SLOPE RATIOS ARE AS FOLLOWS:
   A. CUTS – 1.5:1 FOR MINOR SLOPES (UP TO 15' VERTICAL HEIGHT)
   B. CUTS – 2:1 FOR MAJOR SLOPES (OVER 15' VERTICAL HEIGHT)
   C. FILLS – 2:1 (MAXIMUM) FOR ALL FILL SLOPES
10. NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE GRADING PLANS, THE OWNER AND PERMITEE ARE RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO ADJACENT PROPERTIES. NO PERSON SHALL EXCAVATE SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET OR SIDEWALK, OR THE FUNCTION OF ANY SEWAGE DISPOSAL SYSTEM OR ANY OTHER PUBLIC OR PRIVATE PROPERTY.
11. THE DIRECTOR OF PLANNING AND DEVELOPMENT SERVICES MAY IMPOSE CONDITIONS THAT ARE REASONABLY NECESSARY TO PREVENT THE CREATION OF A NUISANCE OR HAZARD TO PERSONS OR TO PUBLIC OR PRIVATE PROPERTY. THE DIRECTOR MAY ALSO MODIFY OR ADD CONDITIONS TO ANY VALID GRADING PERMIT WHEN SUCH MODIFICATIONS OR ADDITIONS ARE REASONABLY NECESSARY TO PREVENT THE CREATION OF A NUISANCE OR HAZARD TO PERSONS OR TO PUBLIC OR PRIVATE PROPERTY. SUCH CONDITIONS MAY INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
    A. IMPROVEMENT OF EXISTING GRADING TO CONFORM WITH THE GRADING ORDINANCE, AND;
    B. REQUIREMENTS FOR FENCING OF EXCAVATIONS OR FILLS THAT WOULD OTHERWISE BE HAZARDOUS, AND;
    C. ADEQUATE DUST CONTROL MEASURES.
12. ALL OPERATIONS CONDUCTED ON THE PREMISES, INCLUDING THE WARMING UP, REPAIR, ARRIVAL, DEPARTURE OR RUNNING OF TRUCKS, EARTH MOVING EQUIPMENT, CONSTRUCTION EQUIPMENT OR ANY OTHER ASSOCIATED GRADING EQUIPMENT SHALL BE LIMITED TO THE PERIOD BETWEEN 7:00AM AND 6:00PM MONDAY THROUGH SATURDAY. NO EARTH MOVING OR GRADING SHALL BE CONDUCTED ON SUNDAYS OR HOLIDAYS.
13. THE CONTRACTOR SHALL VERIFY THE EXISTENCE AND LOCATION OF ALL UTILITES BEFORE COMMENCING WORK. NOTICE OF THE PROPOSED WORK SHALL BE PROVIDED TO THE FOLLOWING AGENCIES BY CALLING 1-800-422-4133 FOR UTILITY CONTACT INFORMATION
    A. SAN DIEGO GAS AND ELECTRIC
    B. PHONE SERVICE
    C. CABLE TV SERVICE
    D. WATER UTILITY
    E. SEWER UTILITY
14. APPROVAL OF THESE PLANS BY THE DIRECTOR OF PLANNING AND DEVELOPMENT SERVICE DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION IS OBTAINED, RIGHT TO ENTRY FORM COMPLETED AND VALID GRADING PERMIT ISSUED.
15. THE ISSUANCE OF A GRADING PERMIT SHALL CONSTITUTE AN AUTHORIZATION TO PERFORM ONLY THAT WORK WHICH IS DESCRIBED OR SHOWN ON THE GRADING PERMIT APPLICATION AND APPROVED GRADING PLANS. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ANY CONDITIONS IMPOSED BY THE DIRECTOR OF PLANNING AND LAND USE AND IN ACCORDANCE WITH THE GRADING ORDINANCE.

PRE-CONSTRUCTION NOTICES

THE SUBJECT PROPERTY CONTAINS HABITAT WHICH MAY BE USED FOR NESTING BY MIGRATORY BIRDS. ANY GRADING, BRUSHING, OR CLEARING CONDUCTED DURING THE MIGRATORY BIRD BREEDING SEASON, FEBRUARY – AUGUST 31, HAS THE POTENTIAL TO IMPACT NESTING OR BREEDING BIRDS IN VIOLATION OF THE MIGRATORY BIRD TREATY ACT. THE APPLICANT MAY SUBMIT EVIDENCE THAT NESTING OR BREEDING MIGRATORY BIRDS WILL NOT BE AFFECTED BY THE GRADING, BRUSHING, OR CLEARING. TO THESE AGENCIES: CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE, 3883 RUFFIN RD., SAN DIEGO, CA 92123 (858)467-4201, HTTP://WWW.DFG.CA.GOV/; AND UNITED STATES FISH AND WILDLIFE SERVICE, 2177 SALK AVENUE, SUITE 250, CARLSBAD, CALIFORNIA 92008, (760) 431-9440, HTTP://WWW.FWS.GOV

NOTICE: IN THE EVENT THAT ANY ACTIVITY, INCLUDING EARTHMOVING OR CONSTRUCTION, DISCOVERS THE PRESENCE OF UNDERGROUND STORAGE TANKS, SEPTIC TANKS, WELLS, SITE DEBRIS, AND/OR CONTAMINATED SOILS ON-SITE, THE CONTRACTOR AND/OR PROPERTY OWNER SHALL NOTIFY THE COUNTY OF SAN DIEGO PLANNING & DEVELOPMENT SERVICES DEPARTMENT AND THE DEPARTMENT OF ENVIRONMENTAL HEALTH AND QUALITY. THE PRESENCE OF CONTAMINATED SOILS WILL REQUIRE SOIL TESTING AND REMEDIATION IN ACCORDANCE WITH STANDARD COUNTY PROCEDURES. THIS PROCESS WILL BE DETERMINED ONCE THE COUNTY IS NOTIFIED OF THE PRESENCE OF CONTAMINATED SOILS.

DIGALERT 811



VICINITY MAP

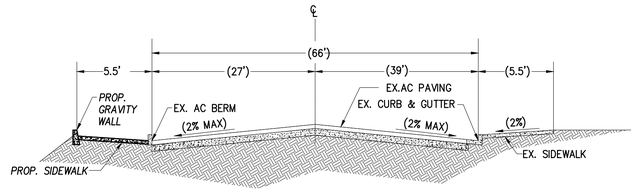
NOT TO SCALE

SHEET INDEX

SHEET DECRIPTION	SHEET	DC
TITLE SHEET	1	G01
EXISTING CONDITION PLAN	2	C01
GRADING PLAN	3	C02
UTILITY PLAN	4	C03
DETAILS	5	C04
SLOPE ANALYSIS	6	C05
EASEMENT EXHIBIT	7	C06
SIGHT DISTANCE EXHIBIT	8	C07

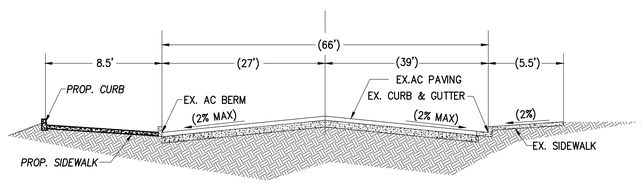
GRADING QUANTITIES

GRADED AREA	1.95 [ACRES]	MAX. CUT DEPTH	10 [FT]
CUT QUANTITIES	2,688 [CYD]	MAX CUT SLOPE RATIO (2:1MAX)	2:1
FILL QUANTITIES	3,225 [CYD]	MAX. FILL DEPTH	10 [FT]
IMPORT	537 [CYD]	MAX FILL SLOPE RATIO (2:1MAX)	2:1



VIA DE LA VALLE – STREET SECTION A-A

NOT TO SCALE



VIA DE LA VALLE – STREET SECTION B-B

NOT TO SCALE

OWNER/APPLICANT

CHABAD OF RANCHO SANTA FE
RABBI LEVI RASKIN
14906 VIA DE LA VALLE
RANCHO SANTA FE, CA 92014
PH. 858-756-7571 / CHABADRSF@GMAIL.COM

REFERENCE DRAWINGS

REFERENCE DRAWING DESCRIPTION 20996-3-D

SITE ADDRESS

14906 VIA DE LA VALLE, RANCHO SANTA FE, CA 92014

TOPOGRAPHY SOURCE

310 VIA VERA CRUZ, #205 SAN MARCOS, CA. 92078
RANCHO COASTAL ENGINEERING & SURVEYING
DECEMBER 16, 2020

BENCHMARK

C.R.T.N. STATION, "CLBD", HAVING A PUBLISHED NAD 83, EPOCH 2017.50, ELEVATION OF 183.39'

ASSESSORS PARCEL NUMBER

APN: 302-110-29-00, 302-110-30-00

EXISTING LEGAL DESCRIPTION

THAT PORTION OF LOT 4 IN SECTION 5, TOWNSHIP 14 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF TOGETHER WITH THAT PORTION OF MAGGIE BRANSON TRACT AS SHOWN ON PARTITION MAP O RANCHO SAN DIEGUITO, FILED IN BOOK OF PATENTS VOLUME 1, PAGE 277 OF OFFICIAL RECORDS

LEGEND

PROPOSED IMPROVEMENTS

IMPROVEMENT	STANDARD DWGS.	SYMBOL
PROPERTY LINE/℄		℄
RIGHT OF WAY/R/W.		R/W
CENTER LINE		
EXISTING EASEMENT		
CURB (PVT).	SDG-150.	
CURB & GUTTER (PVT)	SDG-151	
GRADE BRAKE		
PROPOSED BUILDING		
4" PCC SIDEWALK (PRIVATE)		
AC PAVEMENT (PRIVATE)		
LANDSCAPE AREA		
DECORATIVE PAVER		
BIOFILTRATION BASIN (PVT)		
POINT OF CONNECTION (POC)		
6" FIRE WATER SERVICE (PVC) (PVT).	SDW-118.	FS
FIRE HYDRANT (PVT).	SDW-104.	
DAYLIGHT LIMIT		
PROPOSED MINOR CONTOUR		
PROPOSED MAYOR CONTOUR		
STORM DRAIN IMPROVEMENTS		
GROUTED RIR-RAP		
PRECAST CONCRETE CATCH BASIN (PVT – SIZE PER PLAN).		
STORM DRAIN PIPE (PVT).		SD

EXISTING IMPROVEMENTS

ITEM	SYMBOL
EXISTING CENTERLINE	
EXISTING ROW	
SEWER MANHOLE	
WATER METER	
STORM DRAIN PIPE (PVT)	
WATER LINE (PVT)	(W)
SEWER LINE (PVT)	(S)
GAS LINE (PVT)	(G)
CURB (PVT)	
6" CURB & GUTTER	
IRON FENCE.	X X X
CURB RAMP (PVT)	
SEWER MANHOLE.	
UTILITY	
WATER VALVE.	
STREET LIGHT.	
FIRE HYDRANT.	
STREET SIGN	
MINOR CONTOUR	
MAJOR CONTOUR	

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025 DATE:

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO
SWS ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: 21-257
Scale:
Drafted by: CS / DN
Checked by: MDS
Date Issued: 09/8/23

Sheet Title:
TITLE SHEET

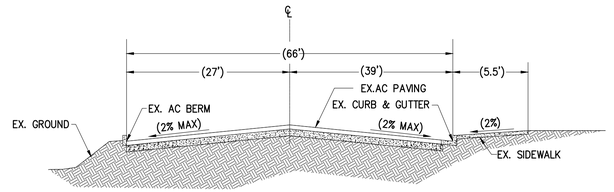
Sheet Number:
G01

EASEMENT NOTES

A. CENTERLINE OF UTILITY EASEMENT GRANTED TO THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY MARCH 27, 1928 IN BOOK 1423, PAGE 473 OF DEEDS (WIDTH NOT DISCLOSED OF RECORD).

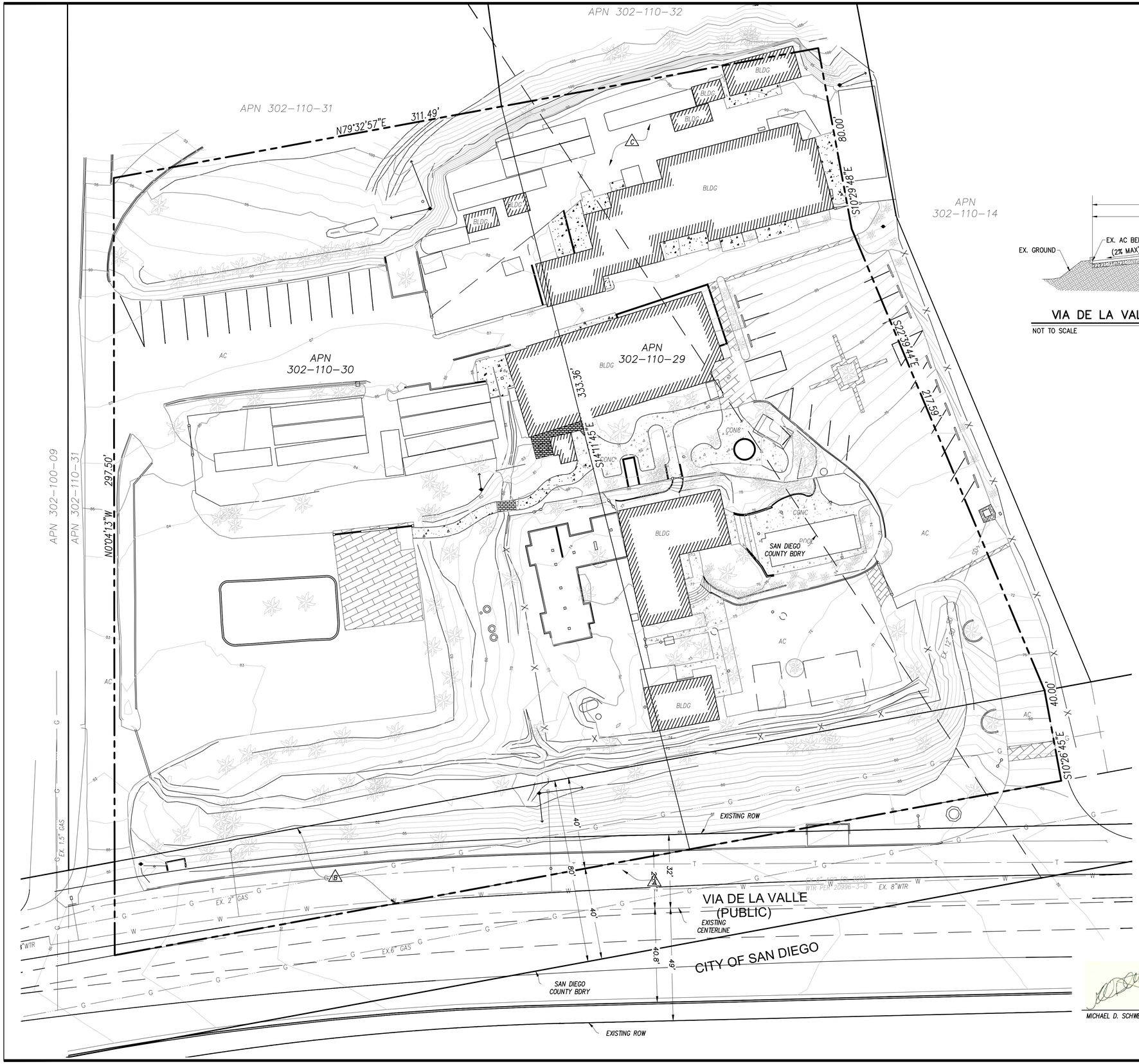
B. PUBLIC ROAD EASEMENT GRANTED TO THE COUNTY OF SAN DIEGO NOVEMBER 12, 1930 IN BOOK 1790, PAGE 193 OF DEEDS.

C. UTILITY EASEMENT GRANTED TO SDG&E FEBRUARY 9, 1962 AT FILE/PAGE NO. 24045 OF OFFICIAL RECORDS.



VIA DE LA VALLE – EXISTING STREET SECTION

NOT TO SCALE



1"=20'

20 10 0 20 40 60

SCALE IN FEET
GRAPHIC SCALE

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025

DATE:

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

DATE: 9/12/2023 10:14:24 AM BY: BRENDA HOUSTON
FILE: N:\Active\21-257\Civil\Exhibits\MUP\21-257 SHEET EXHIBITS MUP 02.dwg

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
EXISTING CONDITION PLAN

Sheet Number:
C01

NOTES

WORK WITHIN THE CITY OF SAN DIEGO ROW WILL REQUIRE A CITY ENCROACHMENT PERMIT.

THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF THE PROPOSED DEVELOPMENT PROJECT. THE OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.

EASEMENT NOTES

A CENTERLINE OF UTILITY EASEMENT GRANTED TO THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY MARCH 27, 1928 IN BOOK 1423, PAGE 473 OF DEEDS (WIDTH NOT DISCLOSED OF RECORD).

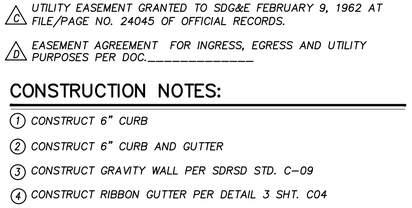
B PUBLIC ROAD EASEMENT GRANTED TO THE COUNTY OF SAN DIEGO NOVEMBER 12, 1930 IN BOOK 1790, PAGE 193 OF DEEDS.

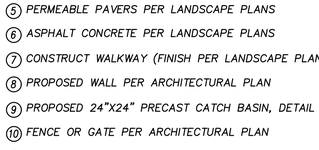
C UTILITY EASEMENT GRANTED TO SDG&E FEBRUARY 9, 1962 AT FILE/PAGE NO. 24045 OF OFFICIAL RECORDS.

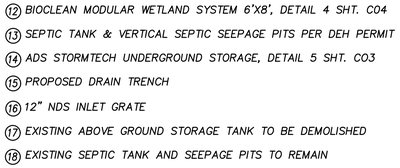
D EASEMENT AGREEMENT FOR INGRESS, EGRESS AND UTILITY PURPOSES PER DOC._____

CONSTRUCTION NOTES:

1. CONSTRUCT 6" CURB
2. CONSTRUCT 6" CURB AND GUTTER
3. CONSTRUCT GRAVITY WALL PER SDRSD STD. C-09
4. CONSTRUCT RIBBON GUTTER PER DETAIL 3 SHT. C04
5. PERMEABLE PAVERS PER LANDSCAPE PLANS
6. ASPHALT CONCRETE PER LANDSCAPE PLANS
7. CONSTRUCT WALKWAY (FINISH PER LANDSCAPE PLANS)
8. PROPOSED WALL PER ARCHITECTURAL PLAN
9. PROPOSED 24"X24" PRECAST CATCH BASIN, DETAIL 2 SHT. C04
10. FENCE OR GATE PER ARCHITECTURAL PLAN
11. BIOCLEAN MODULAR WETLAND SYSTEM 8'X12', DETAIL 1 SHT. C04
12. BIOCLEAN MODULAR WETLAND SYSTEM 6'X8', DETAIL 4 SHT. C04
13. SEPTIC TANK & VERTICAL SEPTIC SEEPAGE PITS PER DEH PERMIT
14. ADS STORMTECH UNDERGROUND STORAGE, DETAIL 5 SHT. C03
15. PROPOSED DRAIN TRENCH
16. 12" NDS INLET GRATE
17. EXISTING ABOVE GROUND STORAGE TANK TO BE DEMOLISHED
18. EXISTING SEPTIC TANK AND SEEPAGE PITS TO REMAIN
19. EXISTING POWER POLE TO REMAIN, TO BE UNDERGROUNDED IN FUTURE PHASE
20. FDC AND PIV PER UNDERGROUND FIRE PLANS
21. PROPOSED FIRE HYDRANT PER UNDERGROUND FIRE PLANS
22. CONCRETE BENCH PER LANDSCAPE PLAN
23. 4" DECOMPOSED GRANITE OVER 4" AGGREGATE WALKWAY
24. PROPOSED DRAINAGE BROW DITCH PER SDRSD STD D-75
25. EXISTING AC BERM TO REMAIN
26. CURB INLET TYPE A PER SDRSD STD D-01
27. STORM DRAIN CLEANOUT TYPE A PER SDRSD STB D-09







MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025

DATE:

SCALE IN FEET
GRAPHIC SCALE

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

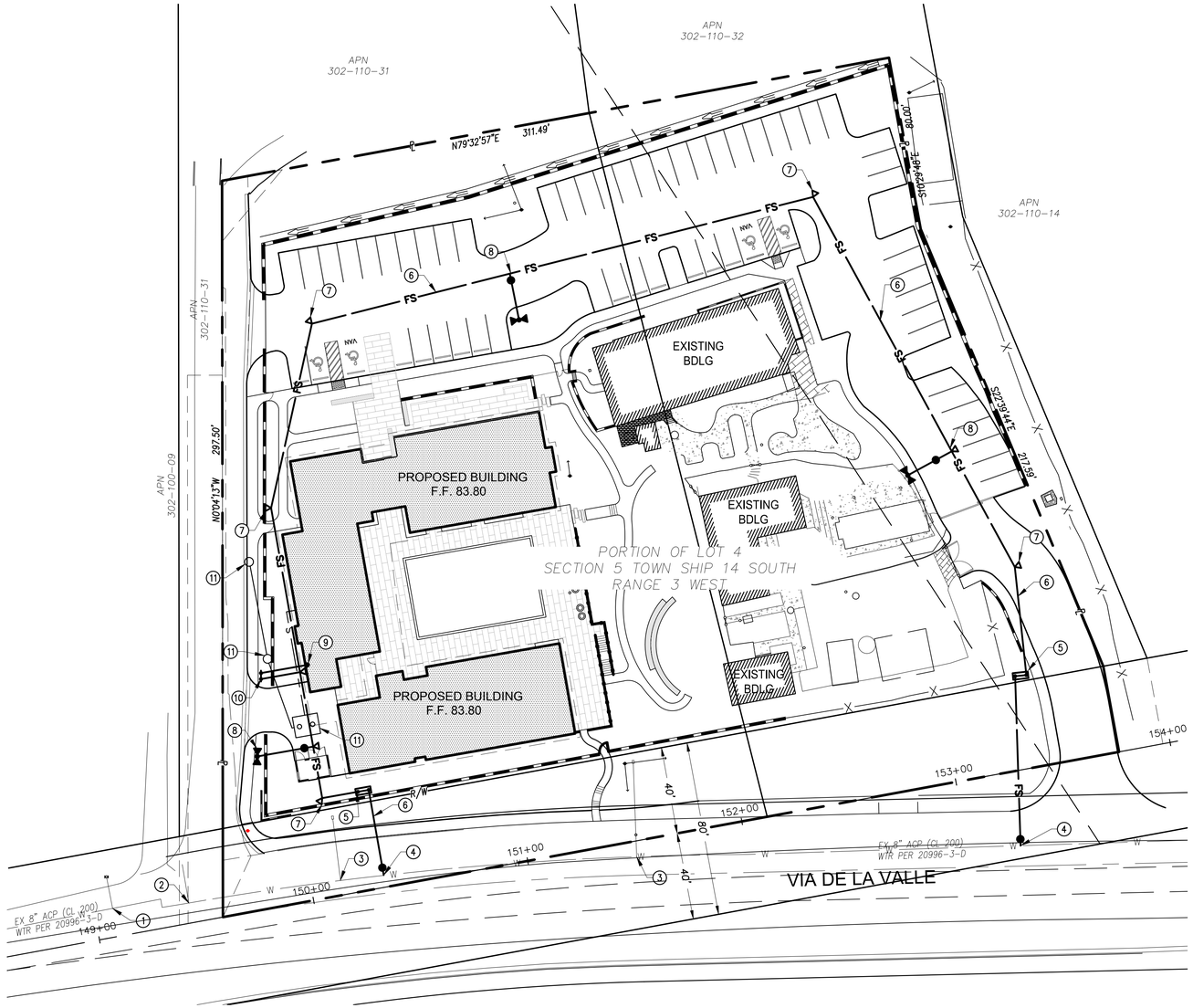
14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
GRADING PLAN

Sheet Number:
C02



CONSTRUCTION NOTES

1. EX FIRE PER 20996-3-D TO REMAIN
2. EX 1" WTR LATERAL PER 20996-3-D TO REMAIN
3. REMOVE 1" WTR SERVICE & REPLACE W/ 2" SERVICE LATERAL
4. CONNECT TO EXISTING 8" WATER LINE
5. 8" DCDA W/ FDC
6. PROPOSED 8" PRIVATE FIRE LINE
7. THRUST BLOCK PER C.O.S.D. SDW-151
8. PROPOSED 6" FIRE HYDRANT LATERAL PER C.O.S.D. SDW-104
9. 8" FIRE LINE P.O.C, SEE PLANS BY OTHER FOR CONTINUATION
10. FDC AND PIV
11. VERTICAL SEPTIC SEEPAGE PIT PER DEH PERMIT

LEGEND

PRIVATE FIRE IMPROVEMENTS

- *FIRE LINE (PVT)* — FS
- *FIRE HYDRANT*
- *8" DCDA*
- *GATE VALVE*
- *BUILDING P.O.C.*
- *FDC/PIV*

30 15 0 30 60 90
SCALE IN FEET
GRAPHIC SCALE

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025

DATE:

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO • NASHVILLE • PHOENIX • ORLANDO

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

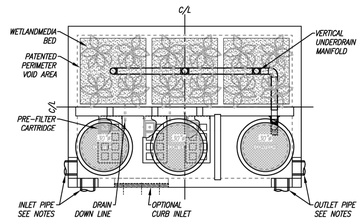
Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
UTILITY PLAN

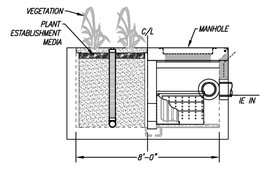
Sheet Number:
C03

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	Chabad Rancho Santa Fe		
PROJECT LOCATION	14906 Via De La, Ranch Santa Fe, CA		
STRUCTURE ID	IMP-1.1		
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.346
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



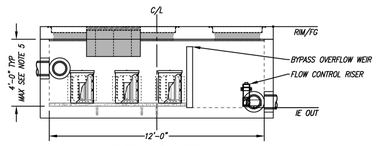
PLAN VIEW



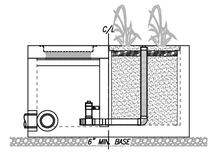
LEFT END VIEW

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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

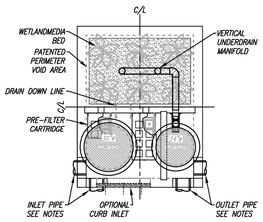
PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

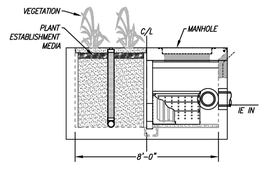
MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	Chabad Rancho Santa Fe		
PROJECT LOCATION	14906 Via De La, Rancho Santa Fe, C		
STRUCTURE ID	IMP-2		
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.167
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



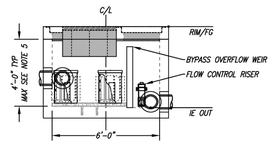
PLAN VIEW



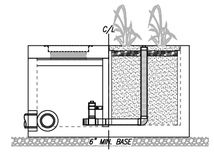
LEFT END VIEW

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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

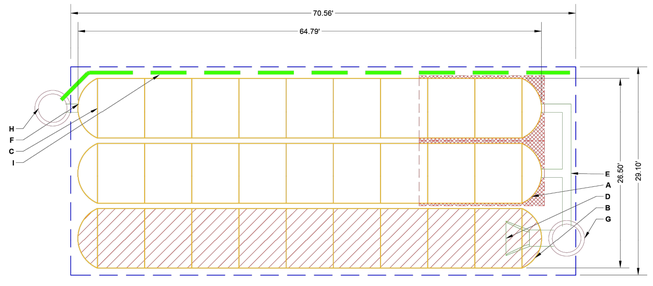
MWS-L-6-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

(PRIVATE)

NOT TO SCALE

MODULAR WETLAND SYSTEM DETAIL 4

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:		*INVERT ABOVE BASE OF CHAMBER					
27	STORMTECH MC-7200 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75	PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
6	STORMTECH MC-7200 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25	PREFABRICATED END CAP	A	12" TOP PARTIAL CUT END CAP, PART#: MC7200IEPP12T / TYP OF ALL 12" TOP CONNECTIONS	35.69"	
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75					
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75	PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75					
8536	(INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75	PREFABRICATED END CAP	C	12" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP12B / TYP OF ALL 12" BOTTOM CONNECTIONS	1.55"	
		TOP OF MC-7200 CHAMBER:	5.75					
		12" x 12" TOP MANIFOLD INVERT:	3.72	FLAMP	D	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
		24" ISOLATOR ROW PLUS INVERT:	0.94	MANIFOLD	E	12" x 12" TOP MANIFOLD, ADS N-12	35.69"	
2053	SYSTEM AREA (SF)	12" BOTTOM CONNECTION INVERT:	0.88	PIPE CONNECTION	F	12" BOTTOM CONNECTION	1.55"	
199.3	SYSTEM PERIMETER (ft)	BOTTOM OF MC-7200 CHAMBER:	0.75	CONCRETE STRUCTURE	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		5.0 CFS IN
		UNDERDRAIN INVERT:	0.00	CONCRETE STRUCTURE	H	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		2.0 CFS OUT
		BOTTOM OF STONE:	0.00	UNDERDRAIN	I	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		



(PRIVATE)

ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

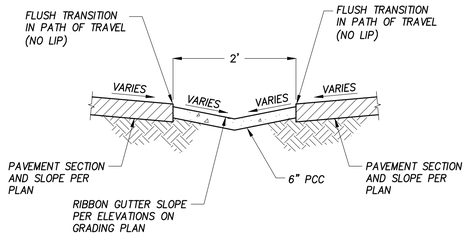
NOTES

- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION**: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHEIVED ON SITE.

(PRIVATE)

NOT TO SCALE

STORMTEK UNDERGROUND STORAGE DETAIL 5



NOTES:

1. CONCRETE SHALL BE 520-C-2500

(PRIVATE)

NOT TO SCALE

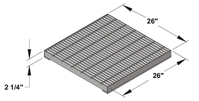
RIBBON GUTTER 3

2424 CAST IRON GRATE

PARKWAY 112 lbs.

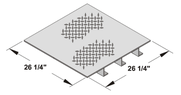
2424 STEEL GRATES

PARKWAY TRAFFIC 48 lbs. 103 lbs.

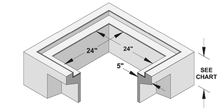


2424 STEEL COVER

PARKWAY TRAFFIC 81 lbs. 114 lbs.

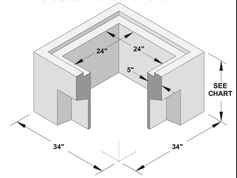


2424 TOP SECTION (WITH GALVANIZED FRAME)



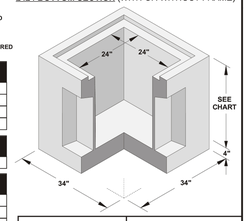
2424 LOWER SECTION (NO FRAME)

NOTE: USE 12", 18", 24" LOWERS TO INCREASE DEPTH UP TO A MAXIMUM OF 72"



7 - 0 4

2424 BOTTOM SECTION (WITH OR WITHOUT FRAME)



NOTES:
1. GRATES AND COVERS AVAILABLE PAINTED BLACK OR GALVANIZED
2. "ADA" GRATES AVAILABLE IN PARKWAY & TRAFFIC .
3. "HEEL PROOF" GRATES AVAILABLE IN PARKWAY ONLY
4. A TOP SECTION WITH FRAME MUST BE USED IF BOLT DOWN REQUIRED

TOP SECTION	HT.	LBS	KNOCK-OUTS
2424 T6	6"	270	NONE
2424 T12	12"	495	(4) 6" x 11"
2424 T18	18"	745	(4) 9" x 12"
2424 T24	24"	870	(4) 14" x 14"

EXTENSION SECTION	HT.	LBS	KNOCK-OUTS
2424 E6	6"	270	NONE

LOWER SECTION	HT.	LBS	KNOCK-OUTS
2424 L12	12"	495	(4) 6" x 11"
2424 L18	18"	745	(4) 9" x 12"
2424 L24	24"	870	(4) 14" x 14"

BOTTOM SECTION	HT.	LBS	KNOCK-OUTS
2424 B30	30"	1595	(4) 18" x 18"
2424 B36	36"	1905	(4) 18" x 18"

24" x 24" CATCH BASIN

BROOKS PRODUCTS

2424 CB

DES. LOAD DATE: 11-23-99 | REV. LOAD DATE: 02-28-00

(PRIVATE)

NOT TO SCALE

24" x 24" CATCH BASIN AND GRATE 2

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025

DATE:

1

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO • NASHVILLE • PHOENIX • ORLANDO

SWS ENVIRONMENTAL ENGINEERING P.C.

DATE PLOTTED: 09:43:14 AM 09/09/2024
FILE: L:\Projects\2023\23-257\Design\Drawings\MUP
FILE NAME: 23-257 SHEET DETAILS.dwg

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D. SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

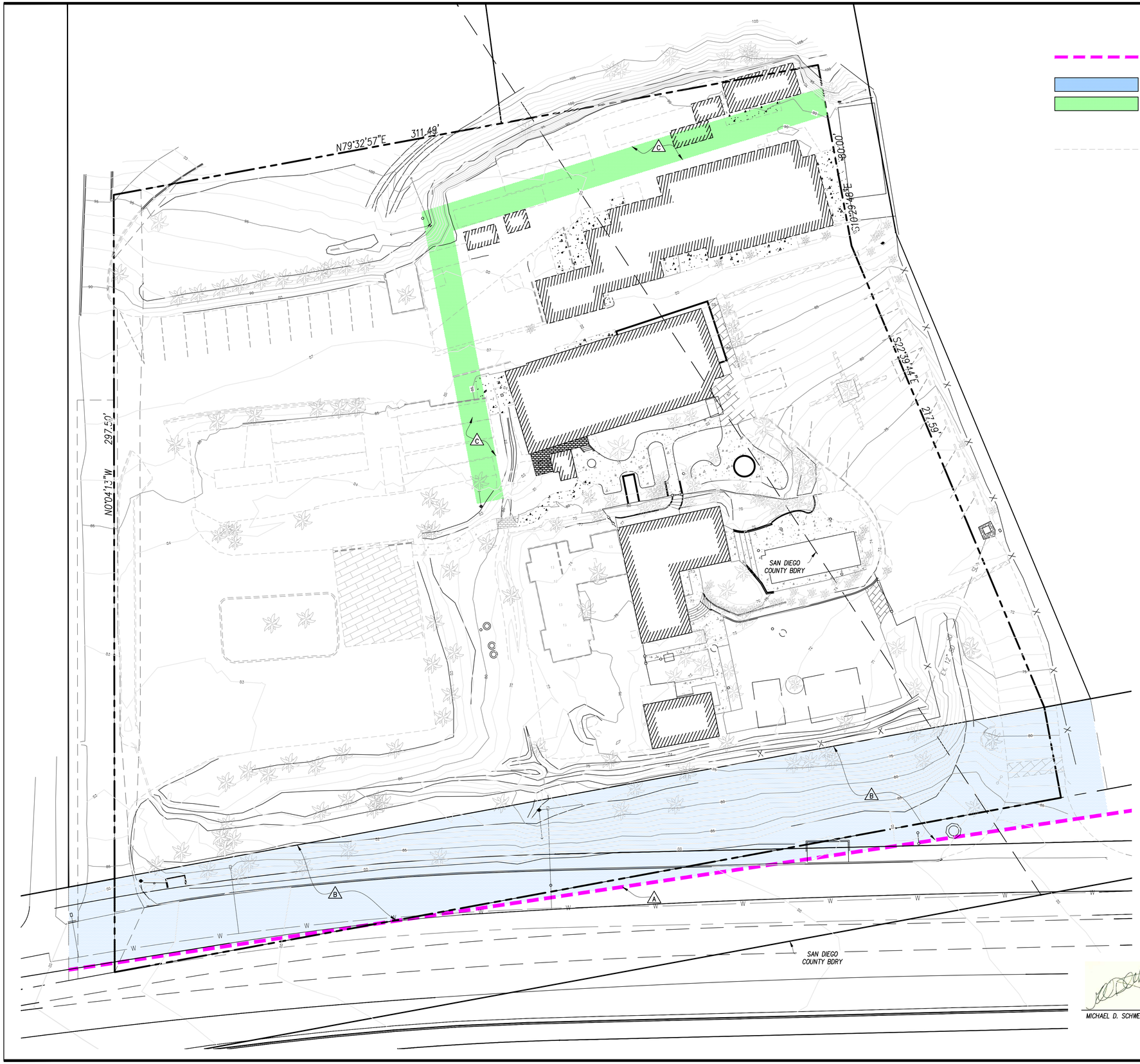
14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
DETAILS

Sheet Number:
C04



EASEMENT NOTES

- A — CENTERLINE OF UTILITY EASEMENT GRANTED TO THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY MARCH 27, 1928 IN BOOK 1423, PAGE 473 OF DEEDS (WIDTH NOT DISCLOSED OF RECORD).
- B — PUBLIC ROAD EASEMENT GRANTED TO THE COUNTY OF SAN DIEGO NOVEMBER 12, 1930 IN BOOK 1790, PAGE 193 OF DEEDS.
- C — UTILITY EASEMENT GRANTED TO SDG&E FEBRUARY 9, 1962 AT FILE/PAGE NO. 24045 OF OFFICIAL RECORDS.

GENERAL NOTE:

EXISTING PLANNIMETRIC FEATURES TO BE DEMOLISHED FOR PROPOSED

NOTES

PLANNING AND LAND USE TO PLANNING AND DEVELOPMENT SERVICES

1"=20'

SCALE IN FEET
GRAPHIC SCALE
20 10 0 20 40 60

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025

DATE:

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO
DATE: 9/7/2023 3:35:43 PM PROGRAM:DWG
FILE NAME:P:\21-257\CAD\C05-EASEMENT.DWG

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

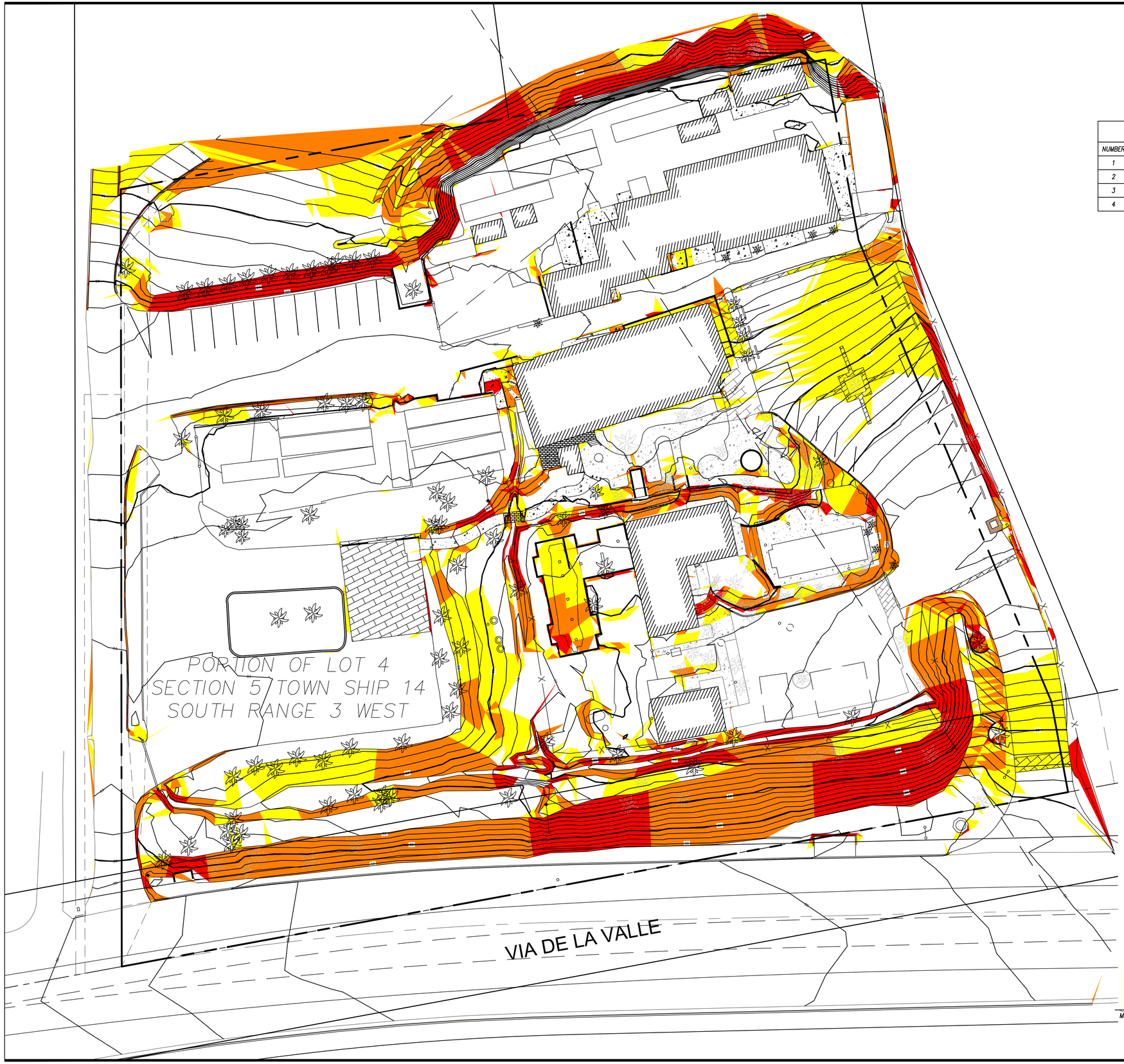
14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
EASEMENT EXHIBIT

Sheet Number:
C05



SLOPES TABLE					
NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	AREA	LOT PERCENTAGE	COLOR
1	0.02%	15.00%	2.49	73.9%	
2	15.00%	25.00%	0.34	10.0%	
3	25.00%	50.00%	0.33	9.8%	
4	50.00%	100.00%	0.21	6.2%	

ENCROACHMENT/OPEN SPACE MAP NOTE:

THIS SITE DOES NOT CONTAIN STEEP SLOPE LANDS DEFINED AS HAVING SLOPE WITH A NATURAL GRADIENT OF 25% OR GREATER AND A MINIMUM RISE OF 50 FEET

1" = 20'

SWS

N

20 10 0 20 40 60

SCALE IN FEET
GRAPHIC SCALE

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025 DATE:

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO • NASHVILLE • PHOENIX • ORLANDO
SWS ENGINEERING, INC.

DATE: 9/10/2025 10:45:30 AM BY:DANIELA DIAZ
FILE PATH: C:\SWS\21-257 CHABAD - RANCHO SANTA FE\CAD\PLOT\21-257 SLOPE ANALYSIS.DWG
FILE NAME: 21-257 SLOPE ANALYSIS.DWG

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
SLOPE ANALYSIS

Sheet Number:
C06



ROAD INFORMATION

VIA DE LA VALLE – 2.1B COMMUNITY COLLECTOR W/ CONTINUOUS TURN LANE
MEASURED PREVAILING SPEED = 45 MPH

WESTERLY DRIVEWAY:

MINIMUM STOPPING SIGHT DISTANCE PER COUNTY PUBLIC ROAD STANDARD = 425 FEET

EASTERLY DRIVEWAY:

MINIMUM STOPPING SIGHT DISTANCE PER SAN DIEGO CITY/AASHTO = 360 FEET

NOTE:

TRIMMING/REMOVAL OF VEGETATION MAY BE NECESSARY TO OBTAIN LINE OF SIGHT.

DRIVEWAY SIGHT DISTANCE MEASURED FROM A POINT ON THE DRIVEWAY 10 FEET FROM THE EDGE OF THE VIA DE LA VALLE PAVEMENT TO A POINT 2 FEET RIGHT OF THE CENTERLINE WITH 3.5 FEET DRIVER HEIGHT ON DRIVEWAY AND 4.25 FEET OBJECT HEIGHT ON ROADWAY.

THERE IS 450 FEET OF UNOBSTRUCTED INTERSECTIONAL SIGHT DISTANCE IN BOTH DIRECTIONS ALONG VIA DE LA VALLE (SC 1525 / S-6) FROM THE ACCESS ROADS SERVING THE PROJECT, IN ACCORDANCE WITH THE METHODOLOGY DESCRIBED IN TABLE 5 OF THE MARCH 2012 COUNTY OF SAN DIEGO PUBLIC ROAD STANDARDS. THESE SIGHT DISTANCES EXCEED THE REQUIRED INTERSECTIONAL SIGHT DISTANCE OF 450 FEET BASED ON A SPEED OF 45 MPH, WHICH I HAVE VERIFIED TO BE THE HIGHER OF THE PREVAILING SPEED OR THE MINIMUM DESIGN SPEED FOR THE ROAD CLASSIFICATION. I HAVE EXERCISED RESPONSIBLE CHARGE FOR THE CERTIFICATION AS DEFINED IN SECTION 6703 OF THE PROFESSIONAL ENGINEERS ACT OF THE CALIFORNIA BUSINESS AND PROFESSIONS CODE.

SAID LINES OF SIGHT FALL WITHIN THE EXISTING RIGHT-OF-WAY AND A CLEAR SPACE EASEMENT IS NOT REQUIRED

1" = 50'
SWS
N

50 25 0 50 100 150
SCALE IN FEET
GRAPHIC SCALE

MICHAEL D. SCHWEITZER R.C.E. NO. 59658 EXP: 12-31-2025 DATE:

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO • NASHVILLE • PHOENIX • ORLANDO

DATE: 9/10/2025, 10:45:42 AM BY: BRYDON ROLLINS
PLOT SCALE: 1.0000 '/ INCH PLOT STYLE TABLE: SWS.CTB
FILE NAME: 21-257 SUP SHT.dwg

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D. SCHWEITZER
No. 59658
Exp.12-31-2025
CIVIL
STATE OF CALIFORNIA

CHABAD - RANCHO SANTA FE

14906 Via De La Valle
Del Mar, CA 92014

Date	Revision
09/08/23	MAJOR USE PERMIT
11/06/24	MUP 2ND SUBMITTAL

Project #: **21-257**
Scale:
Drafted by: **CS / DN**
Checked by: **MDS**
Date Issued: **09/8/23**

Sheet Title:
SIGHT DISTANCE EXHIBIT

Sheet Number:
C07

National Flood Hazard Layer FIRMette

FEMA

117°13'34"W 32°59'18"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

117°12'57"W 32°58'48"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/12/2023 at 11:57 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

STORM WATER MANAGEMENT INVESTIGATION

CHABAD JEWISH CENTER IMPROVEMENTS
14906 VIA DE LA VALLE
SAN DIEGO COUNTY, CALIFORNIA

PREPARED FOR

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

JUNE 14, 2023
PROJECT NO. G3134-52-01

Project No. G3134-52-01
June 14, 2023

Chabad Jewish Center of RSF
P.O. Box 8282
Rancho Santa Fe, California 92067

Attention: Mr. Levi Raskin

Subject: STORM WATER MANAGEMENT INVESTIGATION
CHABAD JEWISH CENTER IMPROVEMENTS
14906 VIA DE LA VALLE
SAN DIEGO COUNTY, CALIFORNIA

Dear Mr. Raskin:

In accordance with your request, we herein submit the results of our storm water management investigation for the subject project in the Rancho Santa Fe area in San Diego County, California (see Vicinity Map).



Vicinity Map

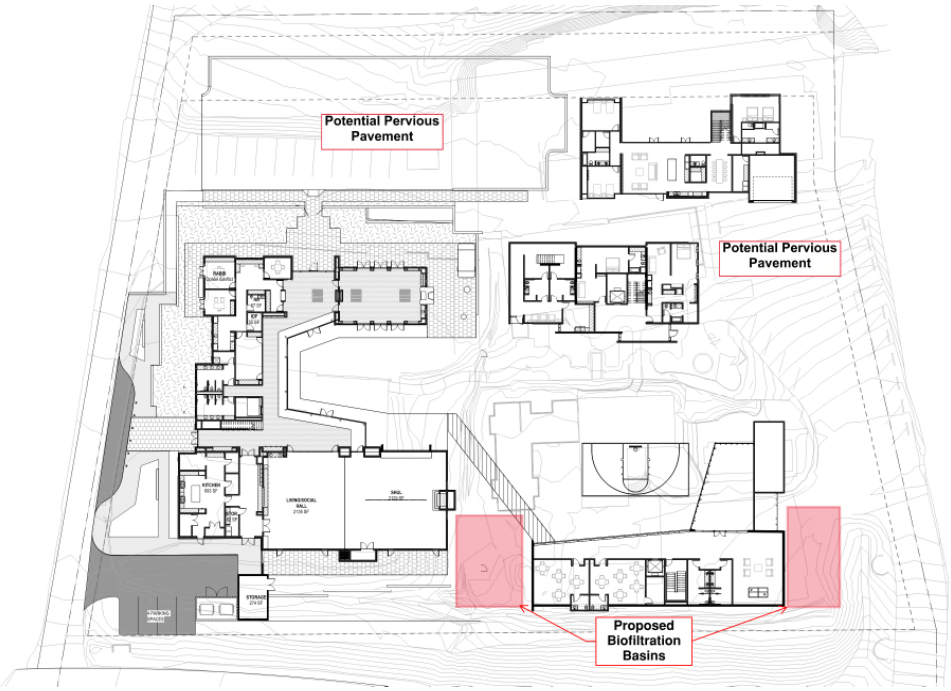
SITE AND PROJECT DESCRIPTION

The property is located at 14906 Via de la Valle in the Rancho Santa Fe area in San Diego County, California. The property currently consists of a few commercial and retail buildings, and some ancillary structures, along with accommodating pavement, utilities, flatwork and landscaping. The property gently to moderately slopes to the southeast with elevations ranging from about 100 feet to 70 feet above Mean Sea Level (MSL) from north to south, respectively. The Existing Site Map shows the current site conditions.



Existing Site Map

Final plans for the project have not yet been prepared; however, we understand the site will be redeveloped as a Jewish services facility in two development phases. The first phase will consist of constructing a 12,520 sq/ft building and the second phase will consist of constructing three buildings, ranging from 2,000 to 6,500 square-feet. We expect each development phase will include associated site improvements such as retaining walls, pavements, flatwork and underground utilities. Two storm water management devices are planned for the south side of the property. The Proposed Site Plan shows the planned buildings and improvements and the planned locations of the storm water management devices.



Proposed Site Plan

We performed our storm water field investigation on June 2, 2023 to evaluate the infiltration characteristics of the on-site material. The work consisted of advancing 2 borings (I-1 and I-2) into the alluvium and performing infiltration tests.

STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the current Storm Water Standards (SWS). If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts because of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table 1 presents the descriptions of the hydrologic soil groups. 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. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

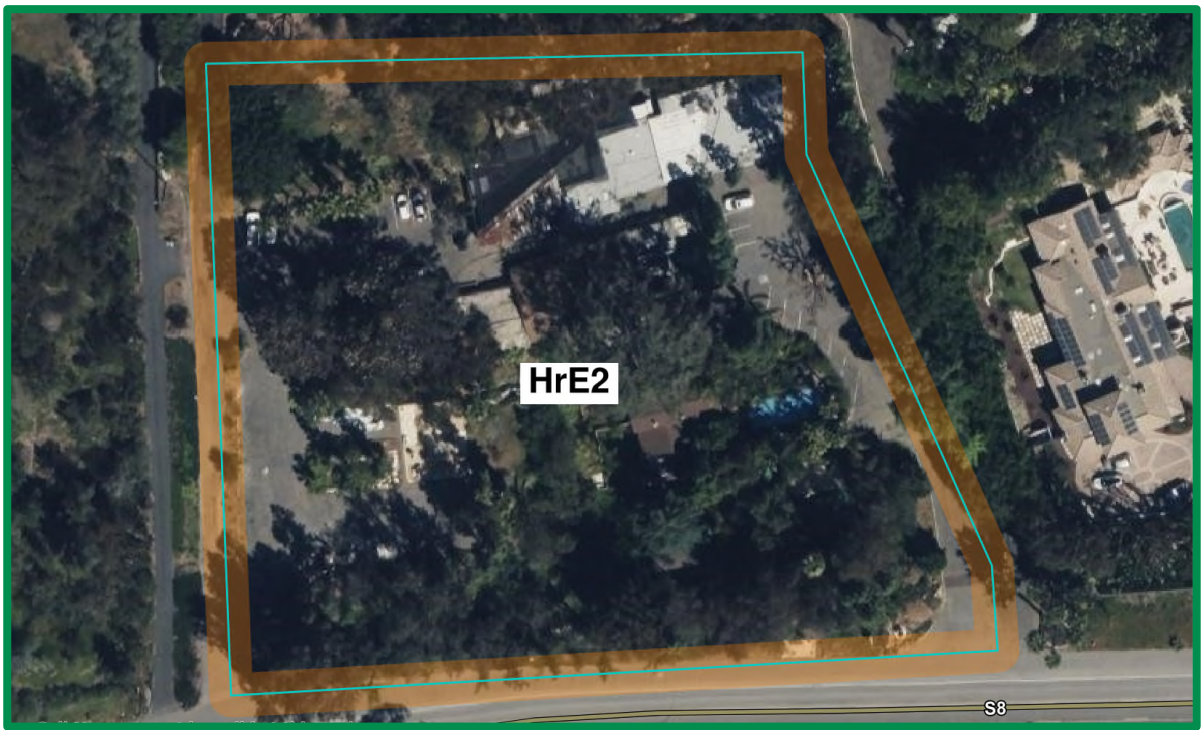
TABLE 1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
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.
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.
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.
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.

According to geologic maps of the area, the property is underlain by alluvium (Qal) and Delmar Formation (Td). We encountered alluvium in the borings performed for this storm water investigation. Some undocumented fill associated with previous development of the property may exist overlying the alluvium. Table 2 presents the information from the USDA website for the subject property. The Hydrologic Soil Group Map presents output from the USDA website showing the limits of the soil units.

TABLE 2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUPS

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/Hour)
Huerhuero loam, 15 to 30 percent slopes, eroded	HrE2	100	D	0.00 to 0.06



Hydrologic Soil Group Map

In-Situ Testing

We performed 2 infiltration tests using the Aardvark permeameter within the general area of potential storm water management basins. The results of the tests provide design parameters regarding the saturated hydraulic conductivity and infiltration characteristics of on-site soil and geologic units. Table 3 presents the results of the estimated field saturated hydraulic conductivity and estimated infiltration rates obtained from the infiltration tests. The field sheets are also attached herein. We applied a feasibility factor of safety of 2.0 to our estimated infiltration rates to provide input on Table D.2-3. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil. The Storm Water Geologic Map, Figure 1, presents the locations of the infiltration tests.

TABLE 3
FIELD PERCOLATION INFILTRATION TEST RESULTS

Test Location	Test Depth (Feet)	Geologic Unit	Field-Saturated Infiltration Rate, k_{sat} (Inch/Hour)	Factored[1] Field Infiltration Rate, k_{sat} (Inch/Hour)
I-1	4.6	Qal	0.058	0.029
I-2	4.1	Qal	0.019	0.009
		Average:	**0.039**	**0.019**

[1]Using a factor of safety of 2.

Infiltration categories include full infiltration, partial infiltration and no infiltration. Table 4 presents the commonly accepted definitions of the potential infiltration categories based on the infiltration rates.

TABLE 4
INFILTRATION CATEGORIES

Infiltration Category	Field Infiltration Rate, I (inches/hour)	Factored Infiltration Rate[1], I (inches/hour)
Full Infiltration	$I > 1.0$	$I > 0.5$
Partial Infiltration	$0.10 < I \leq 1.0$	$0.05 < I \leq 0.5$
No Infiltration (Infeasible)	$I < 0.10$	$I < 0.05$

[1] Using a Factor of Safety of 2.

GEOLOGIC HAZARDS AND CONSIDERATIONS

Soil/Groundwater Contamination or Industrial Activities

During our investigation, we did not observe, nor are we aware of any soil or groundwater contamination Additionally, we did not observe any industrial activities adjacent to the site. The environmental consultant should evaluate if infiltration would be possible from an environmental standpoint, if allowed. We expect infiltration associated with this risk would be considered feasible.

Groundwater Elevations/Well or Groundwater Basin

The *BMP Design Manual* indicates that the depth to the groundwater table beneath an infiltration BMP must be greater than 10 feet for infiltration to be allowed. We did not encounter static groundwater during our field investigation to the maximum depth explored. We expect static groundwater exists at depths greater than 50 feet below existing grades. We did not observe a well or groundwater basin within 100 feet of the proposed basins. Therefore, infiltration due to groundwater elevations, wells or groundwater basins would be considered feasible at the site.

Septic Tanks/Leach Fields

We understand the site does not have any existing septic tanks or leach fields. Full or partial infiltration is feasible at the site as long as a 50-foot setback from existing or proposed septic tanks or leach fields is incorporated into the design.

Existing and Planned Structures

Several commercial and retail buildings currently exist at the site. Development plans consist of demolishing the existing structures and constructing a new Jewish services facility consisting of 4 new buildings. Water should not be allowed to infiltrate in areas where it could affect the existing or proposed

structures. Mitigation for existing structures consists of not allowing water infiltration within a lateral distance of at least 10 feet from the new or existing foundations and property lines.

New or Existing Utilities

Existing utilities are located in the roadways adjacent to the site and within the current site limits. Full or partial infiltration should not be allowed in the areas of the existing or proposed utilities to help prevent potential damage/distress to improvements. Mitigation measures to prevent water from infiltrating the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners. The horizontal and vertical setbacks for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility, respectively.

Existing Fill Materials

We did not encounter undocumented fill in our borings; however, we expect some undocumented fill associated with previous development exists throughout the site. Infiltration should not be allowed in areas with greater than 5 feet of existing fill materials. Due to the potential for lateral water migration within the existing soils, full or partial infiltration should be considered infeasible within the undocumented fill but would be considered feasible in the underlying alluvium and formational materials, provided the fill is relatively thin.

Slope Hazards

The *BMP Design Manual* recommends a minimum setback of 1½ times the height of adjacent steep slopes greater than 4:1 or 25 percent. Several slopes exist throughout the site, including an approximately 15-foot-high slope that descends from Via de la Valle to a drainage channel on the south side of the property. Infiltration devices should not be installed adjacent to slopes unless they are lined, possess a minimum setback distance of 1.5 times the slope height, or extend below the height of the slope.

Considerations of Infiltration Restrictions

The *BMP Design Manual* includes *Table D.1.1: Considerations for Geotechnical Analysis of Infiltration Restrictions* that determines the infiltration restrictions at the site. Table 5 presents the mandatory and optional considerations for the site.

TABLE 5
CONSIDERATIONS FOR GEOTECHNICAL ANALYSIS OF INFILTRATION RESTRICTIONS

Restriction Element		Is Element Applicable? (Yes/No)
Mandatory Considerations	BMP is within 100' of Contaminated Soils	No
	BMP is within 100' of Industrial Activities Lacking Source Control	No
	BMP is within 100' of Well/Groundwater Basin	No
	BMP is within 50' of Septic Tanks/Leach Fields	No
	BMP is within 10' of Structures/Tanks/Walls	No
	BMP is within 10' of Sewer Utilities	No
	BMP is within 10' of Groundwater Table	No
	BMP is within Hydric Soils	No
	BMP is within Highly Liquefiable Soils and has Connectivity to Structures	No
	BMP is within 1.5 Times the Height of Adjacent Steep Slopes (>25%)	No
	County Staff has Assigned "Restricted" Infiltration Category	No
Optional Considerations	BMP is within Predominantly Type D Soil	Yes
	BMP is within 10' of Property Line	No
	BMP is within Fill Depths of >5' (Existing or Proposed)	No
	BMP is within 10' of Underground Utilities	No
	BMP is within 250' of Ephemeral Stream	No
	Other (Provide detailed geotechnical support) – Geologic Hazards	Yes
Result	Based on examination of the best available information, I have **not identified any restrictions** above	O Unrestricted
	Based on examination of the best available information, I have **identified one or more restrictions** above	**X Restricted**

CONCLUSIONS AND RECOMMENDATIONS

Storm Water Evaluation Narrative

The in-place infiltration test locations were selected in areas likely used for possible basins and storm water management devices that correspond with the natural drainage on the site (located in the low points of the property). We performed 2 infiltration tests within the alluvium and the results indicate an average rate of 0.019 inches per hour with an applied factor of safety of 2.

Storm Water Infiltration Conclusion

Infiltration would not be possible in the areas of existing underground utilities and buildings, and areas with fill depths greater than 5 feet, as discussed herein. The average infiltration test results within the alluvium indicate infiltration rates less than 0.05 inches per hour (with a FOS of 2). Therefore, full or partial infiltration within the alluvium is considered infeasible at the site. The rates recorded can be applied to the geologic unit across the property.

Storm Water Infiltration Recommendations

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

Storm Water Standard Worksheets

The BMP Design Manual Table D.2-4 helps the project civil engineer estimate the factor of safety based on several factors. Table 6 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE 6
GUIDANCE FOR DETERMINING INDIVIDUAL FACTOR VALUES (TABLE D.2-4)

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Infiltration Testing Method	Any	At least 2 tests of any kind within 50' of BMP.	At least 4 tests within BMP footprint, OR Large/Small Scale Pilor Infiltration Testing over at least 5% of BMP footprint
Soil Texture Class	Unknown, Silty, or Clayey	Loamy	Granular /Slightly Loamy
Soil Variability	Unknown or high	Moderately Homogenous	Significantly Homogenous
Depth to Groundwater/ Obstruction	<5 feet below BMP	5-15 feet below BMP	>15 feet below BMP

Based on our geotechnical investigation and the previous table, Table 7 presents the estimated factor values for the evaluation of the factor of safety. This table only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

TABLE 7
FACTOR OF SAFETY WORKSHEET DESIGN VALUES (TABLE D.2-3-PART A)

Consideration	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Infiltration Testing Method	0.25	2	0.50
Soil Texture Class	0.25	2	0.50
Soil Variability	0.25	2	0.50
Depth to Groundwater/ Obstruction	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75

[1.] The project civil engineer should complete Table D.2-3 using the data on this table. Additional information is required to evaluate the design factor of safety.

If you have any questions regarding this correspondence, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Bradley R. Kuna
RCE 89846

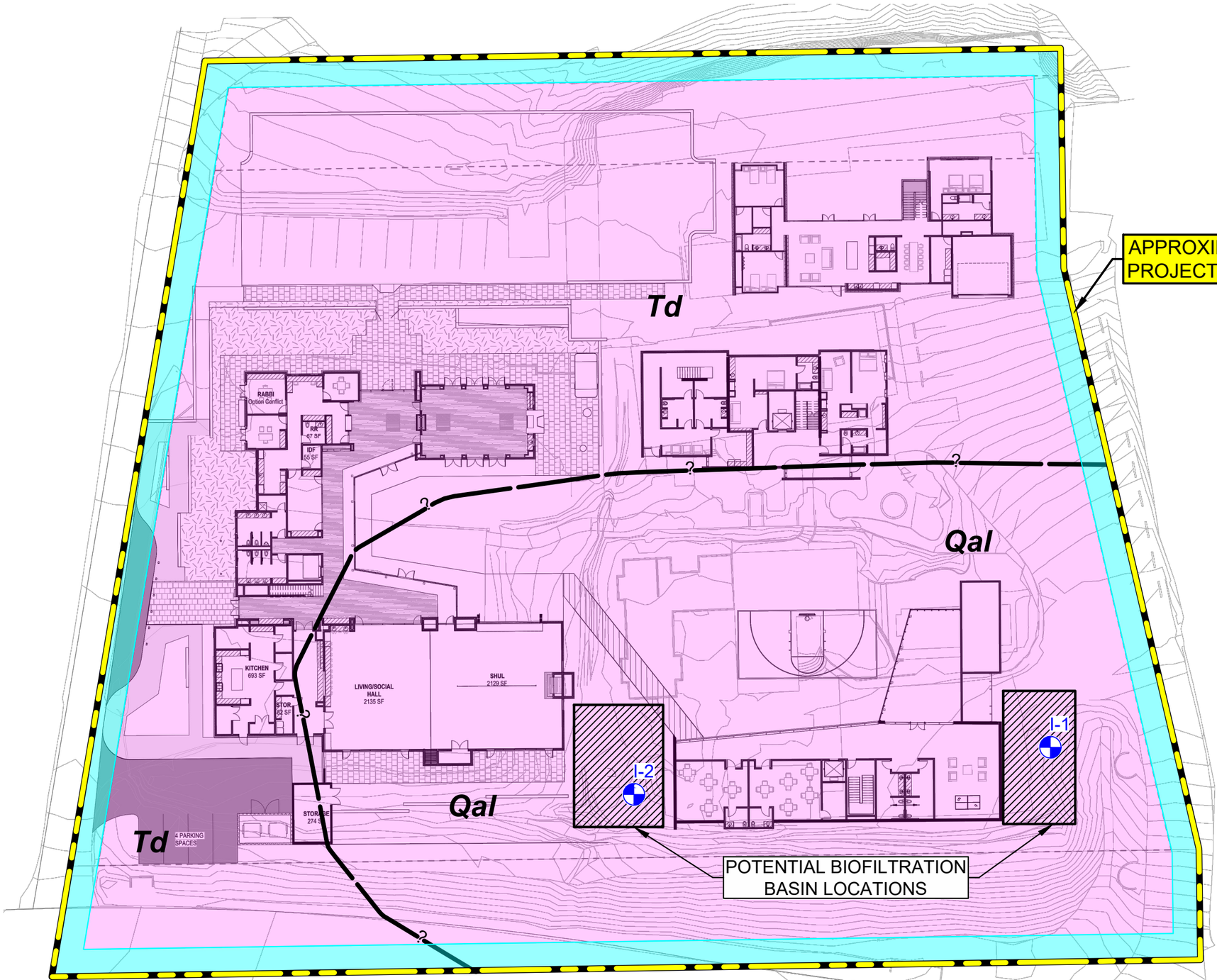
Shawn Foy Weedon
GE 2714

BRK:SFW:arm

Attachments: Storm Water Geologic Map, Figure 1
Aardvark Permeameter Data Sheets (2)

(e-mail) Addressee

CHABAD JEWISH CENTER IMPROVEMENTS
14906 VIA DE LA VALLE
SAN DIEGO COUNTY, CALIFORNIA



0' 40' 80'
SCALE 1"= 40' (On 11x17)

GEOCON LEGEND

Qal .....ALLUVIUM
Td .....DELMAR FORMATION
I-2 .....APPROX. LOCATION OF GEOTECHNICAL BORING
.....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
.....10-FOOT OFFSET FROM PROPERTY LINE (Infiltration Infeasible)
.....INFILTRATION INFEASIBLE DUE TO LOW INFILTRATION RATES

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159
PROJECT NO. G3134 - 52 - 01
FIGURE 1
DATE 06 - 14 - 2023

STORM WATER GEOLOGIC MAP

Plotted:06/14/2023 2:16PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G3134-52-01 (Chabad Jewish Center)\SHEETS\G3134-52-01 StormWaterMAP.dwg

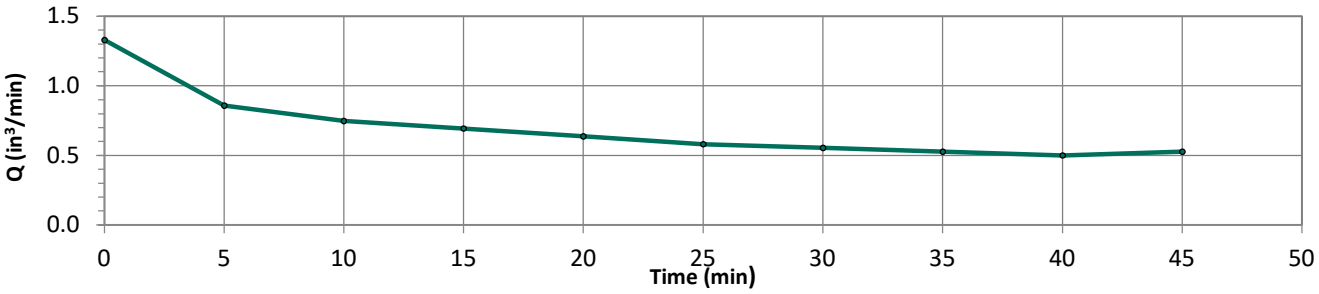
TEST NO.: I-1

GEOLOGIC UNIT: Qal

EXCAVATION ELEVATION (MSL, FT): 71 +/-

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	4.6
TEST/BOTTOM ELEVATION (MSL, FT):	66 +/-
MEASURED HEAD HEIGHT (IN):	6.5
CALCULATED HEAD HEIGHT (IN):	6.2
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**0.517**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.058**
FACTORED INFILTRATION RATE (IN/HR):	**0.029**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	0.240	6.65	1.329
3	5.00	0.155	4.29	0.858
4	5.00	0.135	3.74	0.748
5	5.00	0.125	3.46	0.692
6	5.00	0.115	3.18	0.637
7	5.00	0.105	2.91	0.582
8	5.00	0.100	2.77	0.554
9	5.00	0.095	2.63	0.526
10	5.00	0.090	2.49	0.498
11	5.00	0.095	2.63	0.526

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

AARDVARK PERMEAMETER TEST RESULTS

CHABAD JEWISH CENTER IMPROVEMENTS
14906 VIA DE LA VALLE

PROJECT NO.: G3134-52-01

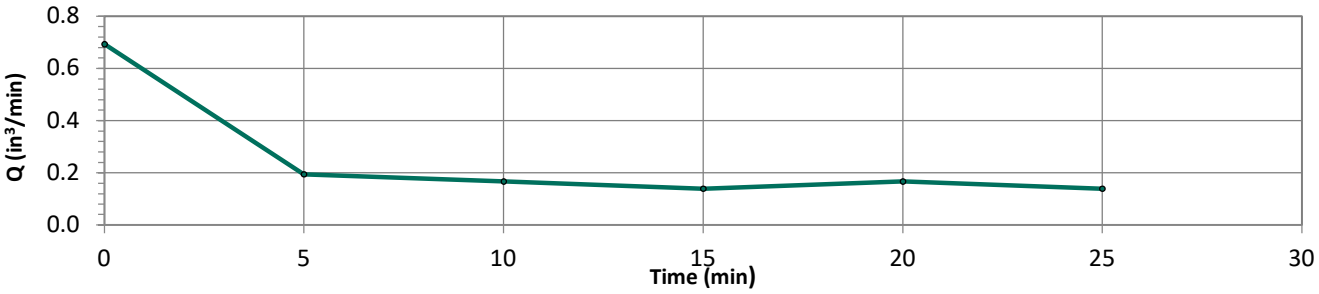
TEST NO.: **I-2**

GEOLOGIC UNIT: **Qal**

EXCAVATION ELEVATION (MSL, FT): **76 +/-**

TEST INFORMATION	
BOREHOLE DIAMETER (IN):	4
BOREHOLE DEPTH (FT):	4.1
TEST/BOTTOM ELEVATION (MSL, FT):	72 +/-
MEASURED HEAD HEIGHT (IN):	5.8
CALCULATED HEAD HEIGHT (IN):	6.1
FACTOR OF SAFETY:	2.0

TEST RESULTS	
STEADY FLOW RATE (IN^3/MIN):	**0.152**
FIELD-SATURATED INFILTRATION RATE (IN/HR):	**0.019**
FACTORED INFILTRATION RATE (IN/HR):	**0.009**



TEST DATA				
Reading	Time Elapsed (min)	Water Weight Consumed (lbs)	Water Volume Consumed (in^3)	Q (in^3/min)
1	0.00	0.000	0.00	0.00
2	5.00	0.125	3.46	0.692
3	5.00	0.035	0.97	0.194
4	5.00	0.030	0.83	0.166
5	5.00	0.025	0.69	0.138
6	5.00	0.030	0.83	0.166
7	5.00	0.025	0.69	0.138

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

AARDVARK PERMEAMETER TEST RESULTS

CHABAD JEWISH CENTER IMPROVEMENTS
14906 VIA DE LA VALLE

PROJECT NO.: G3134-52-01

5.0 General Requirements

- Each Priority Development Project (PDP) must provide a description of existing site conditions and proposed changes to them, including changes to topography and drainage.
- Has a **Drainage Report** has been prepared for the PDP?

  ☒ **Yes**

  - Review of the Drainage Report must be concurrent with the PDP SWQMP.
  - Include the summary page of the Drainage Report with this cover page, and provide the following information:

    Title: Drainage Study for Chabad RSF

    Prepared By: SWS Engineering, Inc.

    Date: 9/9/2025

  - Do not complete the rest of this attachment (also exclude these additional pages from your submittal). Additional documentation of site and drainage conditions is not required unless requested by County staff.

  ☐ **No** -- Complete and submit the remainder of this attachment below.

DRAINAGE STUDY
Chabad RSF

14906 Via De La
Rancho Santa Fe, CA 92067

APN: 302-110-29 and 30

Prepared for:
Chabad Jewish Center of RSF
P.O. Box 8282
Rancho Santa Fe, California 92067
858-756-7571

Engineer:

SWS Engineering, Inc.
1635 Lake San Marcos Drive, Suite 200
San Marcos, California 92078
760-744-0011
PN: 21-257

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONAL CODE, AND THAT THE DESIGN IN CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR THE PROJECT DESIGN.

Prepared by: _____Date: _____
Michael D. Schweitzer RCE# 59658 Exp. 12-31-27

Date	Comments
9-14-23	Original
11-06-24	2nd
5-19-25	3rd
9-9-25	4TH



TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION 1

2.0 PURPOSE 2

3.0 METHODOLOGY 2

4.0 HYDROLOGY 3

4.1 Pre-Development Condition 3

4.2 Post-Development Conditions 3

4.3 FEMA NFIP 3

5.0 CONCLUSION 5

APPENDICES

Appendix A – Reference Charts

Table 3-1 – Runoff Coefficients for Urban Areas

Figure 3-1 – Intensity- Duration Design Chart

Soil Hydrologic Groups Map

100 Year Rainfall Event – 6 Hours (P_6 Rainfall Isopluvials)

100 Year Rainfall Event – 24 Hours (P_{24} Rainfall Isopluvials

Appendix B – Pre-Development Hydrology Calculations

Appendix C – Post-Development Hydrology Calculations

Appendix D – Attenuation Analysis (SWMM)

Appendix E – Hydraulic Calculations

EXHIBITS

Exhibit “A” – Pre-Development Hydrology Map

Exhibit “B” – Post-Development Hydrology Map

1.0 PROJECT DESCRIPTION

The proposed project “Chabad of Rancho Santa Fe” is building a new Chabad Center on the property of approximately 2.77 ac of which 2.72 ac is the study area in the Rancho Santa Fe area in San Diego County, California. The project site located on Via De La Valle approximately 1.5 mile from Interstate 5. The Chabad Center will consist of religious assembly, administration offices, 2 religious school classrooms and meeting spaces for the congregation. The Synagogue and Social Hall will have a capacity of up to 75 people each with garden areas for exterior events. The grandfathered residential and commercial uses (house and candle gift shop) will stay in use and future phases could include a preschool and a residence for the Rabbi and his family. The proposed project will also consist of associated utilities and treatment basin. The site is located on Single Family Residential 2 (SR-2) per General Plan and zoning is Single Family (RS).





2.0 PURPOSE

The purpose of this study is to determine the peak runoff rates for the pre-development and post-development conditions. Comparisons will be made at the same discharge points for each drainage basin affecting the site and adjacent properties. The adequacy of existing and proposed conveyance facilities affected by the project will be determined.

3.0 METHODOLOGY

The Rational Method as outlined in the San Diego County Hydrology Manual, dated June 2003, was used to determine the runoff flow rate. The 100-year frequency storm event was analyzed to determine peak runoff rates discharging the site for both the existing and post-development condition.

Soil type was determined to be type “D” from the Soil Hydrologic Groups map, NRCS Web Soil Survey (see Appendix A). According to geologic maps of the area, the property is underlain by alluvium (Qal) and Delmar Formation (Td). The property gently to moderately slopes to the southeast. Per Geotechnical report (by Geocon Inc. dated June 14, 2023) the site groundwater table is expected to be greater than 50 feet. The runoff coefficient “C” was determined by using the closest matching land use category in Table 3-1 (Appendix A). The exhibits have been prepared for the Pre-Development and Post-Development conditions and are attached as Exhibits “A” and “B”.
Runoff coefficients, “C” is summarized below:

Onsite

- Pre-Development
  - Site Overall Weighted C = 0.66, 56% imperviousness
    Closest matching “C” was selected from the Table 3-1
- Post-Development
  - Site Overall Weighted C= 0.74, 70% impervious
    Closest matching “C” was selected from the Table 3-1

4.0 HYDROLOGY

4.1 Pre-Development Conditions

The property is located at 14906 Via de la Valle in the Rancho Santa Fe area in San Diego County, California. The project site of 2.77 ac (2.72 ac study area) currently consists of a few commercial and retail buildings, and some ancillary structures, along with accommodating pavement, utilities, flatwork and landscaping. The property gently to moderately slopes to the southeast with elevations ranging from about 100 feet to 70 feet above Mean Sea Level (MSL) from north to south, respectively. Major portion of the site runoff surface flow in southerly direction into onsite natural channel located at the south portion of the site where this channel conveys the runoff to the lowest point of the channel located on the southeast portion of the site. There is offsite run-on into project site from north and west side of the site where confluences with the onsite majority runoff toward the low point of the channel. All the runoff from the channel ultimately discharges offsite located on the east driveway via existing storm drain system. There is a small offsite area draining into site from northeast which will discharge offsite into low point of the site conferencing with rest of onsite and offsite runoff from the west. All the onsite and offsite discharge runoff ultimately drain into lined channel located on the southeast of the site (south of Via De Valle) and then into San Dieguito River.

A pre-development hydrology map delineating basin areas, flow paths, and concentration points has been prepared and is attached to this report as Exhibit “A”. Pre-development hydrology calculations can be found in Appendix “B”.

4.2 Post-Development Conditions

The proposed project “Chabad of Rancho Santa Fe” is building a new Chabad Center on the property of approximately 2.77 ac (2.72 ac study area) in the Rancho Santa Fe area in San Diego County, California. The Chabad Center will consist of religious assembly, administration offices, 2 religious school classrooms and meeting spaces for the congregation. The proposed project will also consist of associated utilities, driveways, landscape, parking lots (permeable paver), and treatment system/underground storage.

The runoff from basins-200-A along with offsite runoff from north (basin-100.2) discharge via proposed brow-ditch and storm drain systems into proposed inlet located at the southwest corner of the site where it will confluence with the rest of offsite runoff from west (basin-100-1) into the same inlet. The runoff from basin-B also drains into the same inlet. All these confluence runoffs will bypass the site via proposed onsite storm drain systems into discharge point located at the low point of the east driveway. The runoff from basins 200 (C, H) sheet flow in northerly direction into proposed inlets and then into bypass storm drain system that will confluence with the rest of conveyed runoffs already in the system. The runoff from basins 200 (D,E,F-G) will drain into first treatment system (MWS) and then into underground system (Storm Chamber) via proposed inlets and storm drain systems.

All the treated and detained runoff from basins (D, E, F, G) will discharge into the bypass storm drain system which will confluence with the rest of runoff in the system and finally discharge offsite located on the east driveway low point. The runoff from basins 200-I (existing undisturbed area) and basin-J (west driveway) will discharge into second MWS via inlets and storm drain systems for treatment prior to discharging into west driveway low point, the same as bypass runoff system does.

All the detained onsite and offsite discharge runoff ultimately drain into lined channel located on the southeast of the site (south of Via De Valle) and then into San Dieguito River.

The proposed project onsite runoff will increase by (1.5 cfs) compared to the existing condition because of time of concentration and site imperviousness. The proposed runoff will be reduced below the existing condition by installation of underground storage system (Chamber).

A post-development hydrology map delineating basin area, flow paths, concentration points, and proposed drainage facilities has been prepared and is attached to this report as Exhibit “B”. Post-development hydrology calculations can be found in Appendix C.

4.3 FEMA NFIP

Per FEMA-NFIP Map (Panel 1326 of 2375, Map Number 06073C-1326G), the site in located on Zone X. See appendix A for FEMA maps.

5.0 CONCLUSION

The proposed project will maintain the flow patterns and drainage areas as in the pre-developed condition. Development of the project site will increase the runoff from the pre-developed condition which a construction of proposed underground storage (chamber system) will reduce the excess runoff below the existing condition. Table 2 provides a summary of the pre- and post-development areas and flows. The proposed underground storage will provide storage capacity to satisfy the hydromodification volume requirement as well as the extra volume for the flood control requirement. See the attenuated analysis used EPA SWMM for the runoff from basins (D-G for Q=6.83 cfs)

Table 1 Offsite Area and Flow in both pre and post condition

Basins	Area (ac)	Q_{100} (cfs)
100 (offsite	9.63	12.9

Table 2 – Pre - Development Areas and Flows (Onsite)

Basins	Area (ac)	Q_{100} (cfs)
200 (onsite)	2.72	12.3

Table 3 – Post - Development Areas and Flows (Onsite

Basin-200	Area (ac)	Q_{100} (cfs)	Q_{100} (cfs)
A	0.156	0.81	
B	0.09	0.47	
C	0.11	0.57	
D	0.1	0.51	**6.83***
E	0.35	1.82	
F	0.18	0.94	
G	0.80	3.79	
H	0.21	1.09	
I	0.28	1.46	
J	044	2.27	
Total	**2.72**	**13.73**	

***Discharge into chamber system at the confluence point from Basins D-G for detention**

Table 4 –Pre and Post - Development Flow Comparison at POC-1

Basins	Pre Q_{100} (cfs)	Post Q_{100} (cfs)	Increased Q ± (cfs)	Attenuated Q (cfs)
Offsite & Offsite	18.2	19.7	+1.5	**18.0**

*Construction of underground storage will reduce the post runoff below the existing runoff **(0.2 cfs).** The discharge runoff from project site into San Dieguito River will be lower than the existing runoff and therefore will have no negative impact downstream systems.

REFERENCES

CivilDesign Corporation. *San Diego County Rational Method*. (Software Version 7.7)

County of San Diego Department of Public Works Flood Control Section. *San Diego County Hydrology Manual.* (2003)

County of San Diego Department of Public Works Flood Control Section. *San Diego County Drainage Design Manual.* (2005)

Appendix A

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

Off-Site

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

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

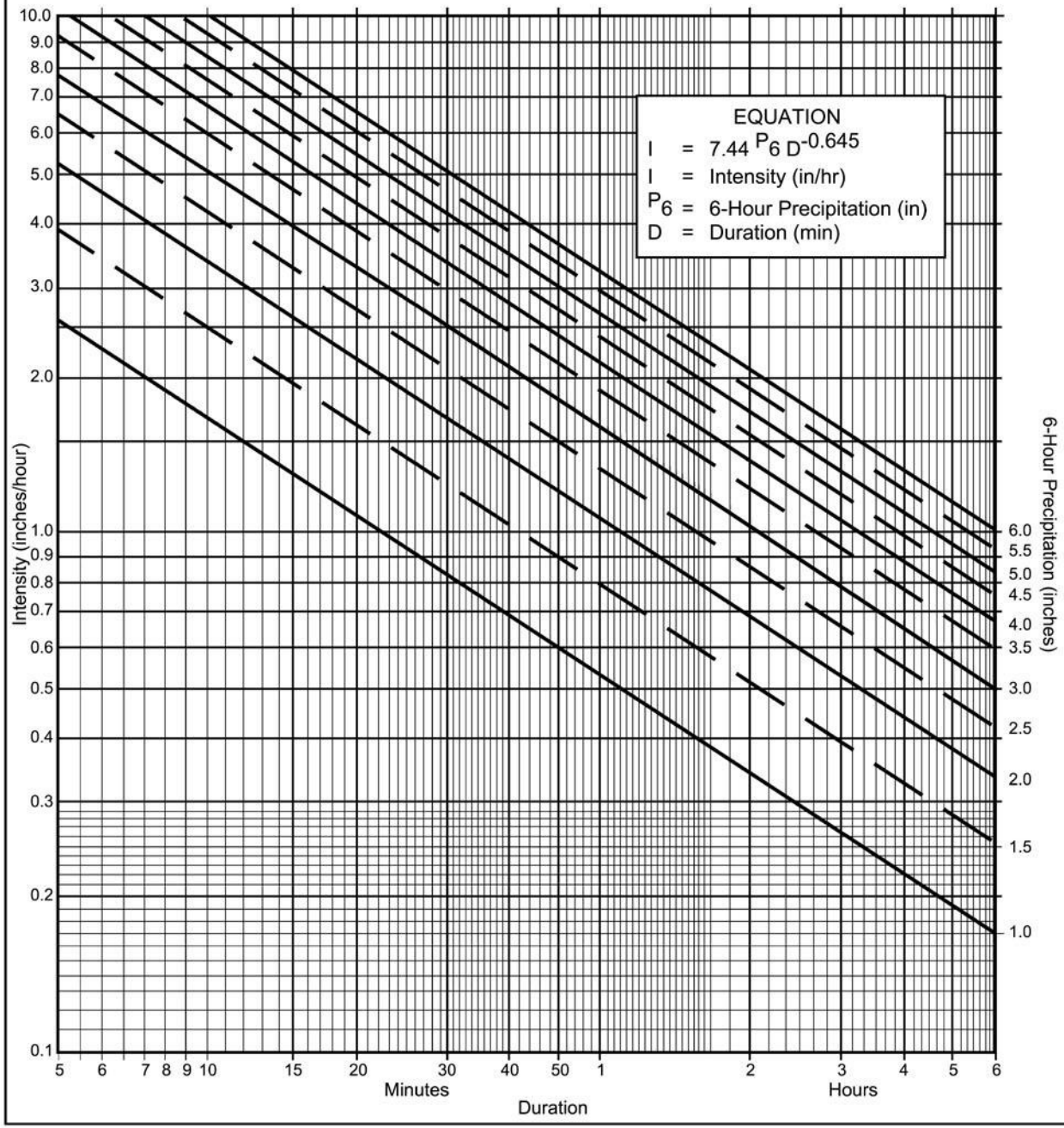
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency _____ year

(b) P_6 = 2.6 in., P_{24} = 4.2, $\frac{P_6}{P_{24}}$ = 62 %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

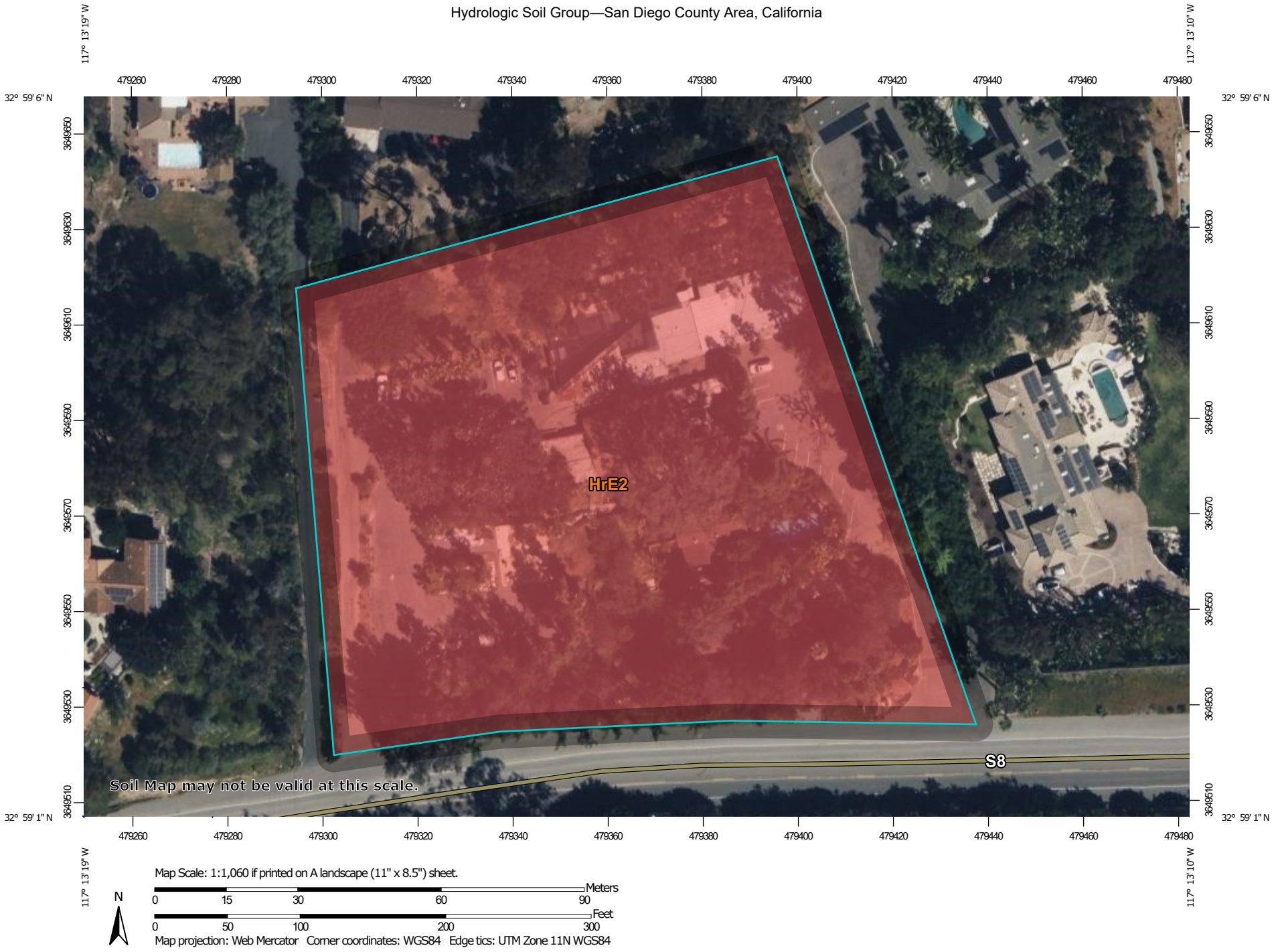
(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1



Map Scale: 1:1,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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 18, Sep 14, 2022

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

Date(s) aerial images were photographed: Mar 24, 2022—Apr 29, 2022

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
HrE2	Huerhuero loam, 15 to 30 percent slopes, eroded	D	3.2	100.0%
Totals for Area of Interest			**3.2**	**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

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

P_6 = 2.6 in

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

P_{24} = 4.2 in

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Copyright SanGIS. All Rights Reserved.

This products may contain information from the SANDAG Regional Information System which cannot be reproduced without the written permission of SANDAG.

This product may contain information which has been reproduced with permission granted by Thomas Brothers Maps.

N W E S

3 0 3 Miles

NOTES TO USERS

ap is for use in administering the National Flood Insurance Program. It does cessarily identify all areas subject to flooding, particularly from local drainage s of small size. The **community map repository** should be consulted for e updated or additional flood hazard information.

ain more detailed information in areas where **Base Flood Elevations** (BFEs) **floodways** have been determined, users are encouraged to consult the Flood and Floodway Data and/or Summary of Stillwater Elevations tables ed within the Flood Insurance Study (FIS) report that accompanies this FIRM. should be aware that BFEs shown on the FIRM represent rounded whole-foot ons. These BFEs are intended for flood insurance rating purposes only and not be used as the sole source of flood elevation information. Accordingly, levation data presented in the FIS report should be utilized in conjunction with M for purposes of construction and/or floodplain management.

l Base Flood Elevations (BFEs) shown on this map apply only landward of rth American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should re that coastal flood elevations are also provided in the Summary of Stillwater ons table in the Flood Insurance Study report for this jurisdiction. Elevations in the Summary of Stillwater Elevations table should be used for construction floodplain management purposes when they are higher than the elevations on this FIRM.

aries of the **floodways** were computed at cross sections and interpolated n cross sections. The floodways were based on hydraulic considerations with to requirements of the National Flood Insurance Program. Floodway widths her pertinent floodway data are provided in the Flood Insurance Study report jurisdiction.

areas not in Special Flood Hazard Areas may be protected by **flood control ures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood nce Study report for information on flood control structures for this jurisdiction.

rojection used in the preparation of this map was Universal Transverse or (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. nces in datum, spheroid, projection or UTM zones used in the production of for adjacent jurisdictions may result in slight positional differences in map s across jurisdiction boundaries. These differences do not affect the accuracy FIRM.

levations on this map are referenced to the North American Vertical Datum of These flood elevations must be compared to structure and ground elevations ced to the same **vertical datum**. For information regarding conversion n the National Geodetic Vertical Datum of 1929 and the North American l Datum of 1988, visit the National Geodetic Survey website at ww.ngs.noaa.gov/ or contact the National Geodetic Survey at the following s:

formation Services
NGS12
al Geodetic Survey
3, #9202
ast-West Highway
Spring, Maryland 20910-3282
13-3242

ain current elevation, description, and/or location information for **bench marks** on this map, please contact the Information Services Branch of the National tic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

map information shown on this FIRM was provided in digital format by the National Agriculture Imagery Program (NAIP). this information was rammetrically compiled at a scale of 1:24,000 from aerial photography dated

ap reflects more detailed and up-to-date **stream channel configurations** ose shown on the previous FIRM for this jurisdiction. The floodplains and ays that were transferred from the previous FIRM may have been adjusted to n to these new stream channel configurations. As a result, the Flood Profiles oodway Data tables *in the Flood Insurance Study report (which contains ative hydraulic data)* may reflect stream channel distances that differ from shown on this map.

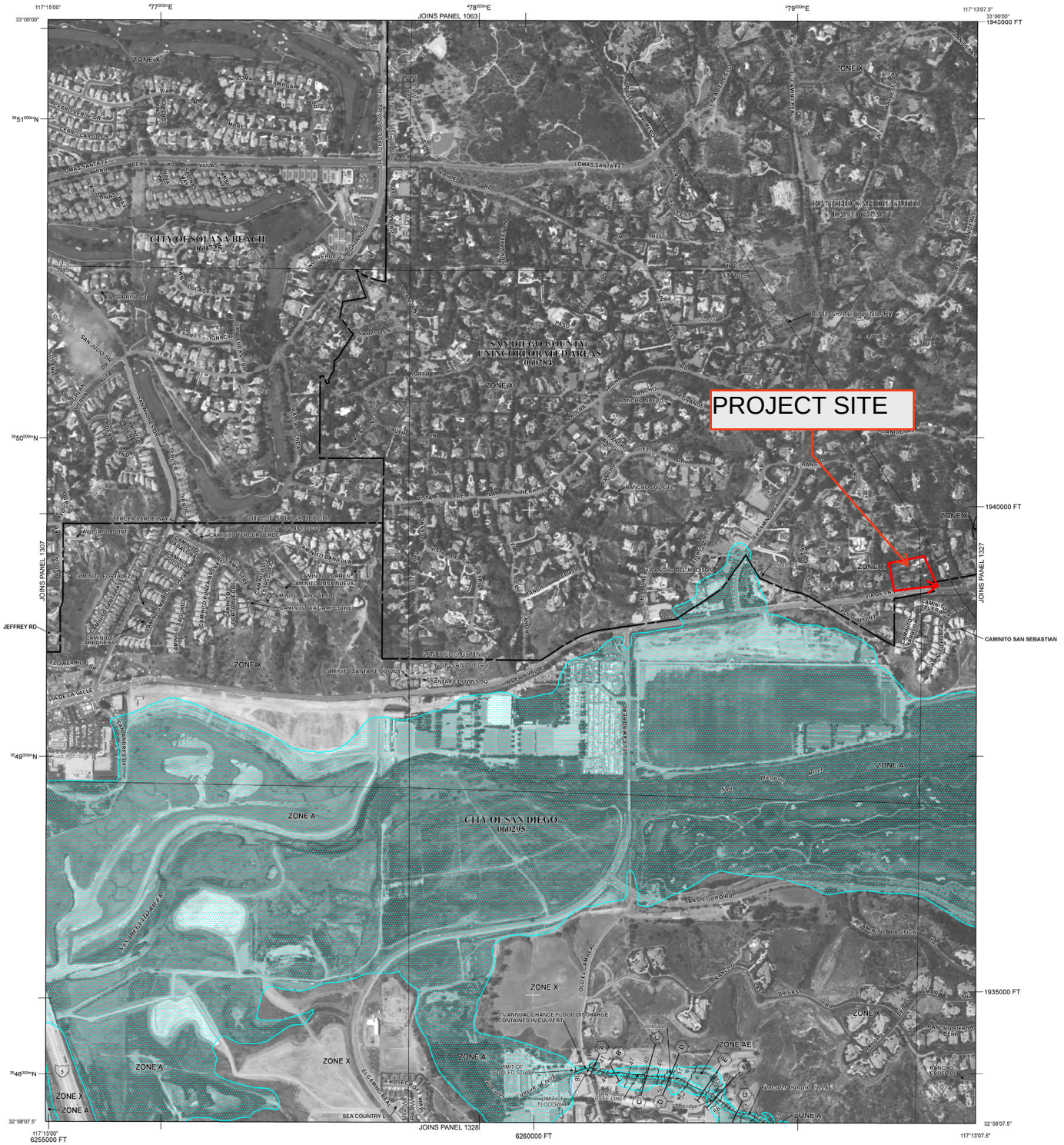
rate limits shown on this map are based on the best data available at the time ication. Because changes due to annexations or de-annexations may have d after this map was published, map users should contact appropriate nity officials to verify current corporate limit locations.

refer to the separately printed **Map Index** for an overview map of the county g the layout of map panels; community map repository addresses; and a of Communities table containing National Flood Insurance Program dates for mmunity as well as a listing of the panels on which each community is

t the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for ation on available products associated with this FIRM. Available products may previously issued Letters of Map Change, a Flood Insurance Study report, digital versions of this map. The FEMA Map Service Center may also be d by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

have questions about this map or questions concerning the National Flood nce Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or e FEMA website at http://www.fema.gov/business/nfip/.

profile base lines" depicted on this map represent the hydraulic modeling es that match the flood profiles in the FIS report. As a result of improved graphic data, the "profile base line", in some cases, may deviate significantly e channel centerline or appear outside the SFHA.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
513 (EL 987) Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A Cross section line
23 — 23 Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE 1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1326G

FIRM

FLOOD INSURANCE RATE

SAN DIEGO COUNT
CALIFORNIA
AND INCORPORATED AR

PANEL 1326 OF 2375

(SEE MAP INDEX FOR FIRM PANEL

CONTAINS:

COMMUNITY	NUMBER	PANEL
SAN DIEGO COUNTY	060284	1326
SAN DIEGO, CITY OF	060295	1326
SOLANA BEACH, CITY OF	060725	1326

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NU
06073C

MAP REV
MAY 16

Federal Emergency Management

National Flood Hazard Layer FIRMette

FEMA

117°13'34"W 32°59'18"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

117°12'57"W 32°58'48"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/12/2023 at 11:57 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX B - PRE-DEVELOPMENT HYDROLOGY CALCULATIONS

```
                San Diego County Rational Hydrology Program

     CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

     Rational method hydrology  program based on
     San Diego County Flood Control Division 2003 hydrology manual
          Rational Hydrology Study        Date: 09/09/25
     ------------------------------------------------------------------------
-----
     21-257 Pre-Deveopment- Chabad Rancho Santa Fe
     100-year Pre Development
     Basin 100-200
     Offsite + Onsite
     ------------------------------------------------------------------------
-----
      *********   Hydrology Study Control Information **********

     ------------------------------------------------------------------------
-----


     Program License Serial Number 6144

     ------------------------------------------------------------------------
-----
     Rational hydrology study storm event year is   100.0
     English (in-lb) input data Units used

     Map data precipitation entered:
     6 hour,  precipitation(inches) =  2.600
     24 hour precipitation(inches) =  4.200
     P6/P24 =    61.9%
     San Diego hydrology manual 'C' values used


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      101.000 to Point/Station
102.000
     **** INITIAL AREA EVALUATION ****
     ________________________________________________________________________
___
     Decimal fraction soil group A = 0.000
     Decimal fraction soil group B = 0.000
     Decimal fraction soil group C = 0.000
     Decimal fraction soil group D = 1.000
     [LOW DENSITY RESIDENTIAL                    ]
     (1.0 DU/A or Less       )
     Impervious value, Ai = 0.100
     Sub-Area C Value = 0.410
     Initial subarea total flow distance  =  100.000(Ft.)
     Highest elevation =  190.000(Ft.)
     Lowest elevation =  184.000(Ft.)
```

```
      Elevation difference =    6.000(Ft.) Slope =  6.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   6.00 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   6.83 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   6.000^(1/3)]=   6.83
      Rainfall intensity (I) =      5.599(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
      Subarea runoff =      1.102(CFS)
      Total initial stream area =        0.480(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      102.000 to Point/Station
103.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      5.950(CFS)
      Depth of flow =   0.936(Ft.), Average velocity =   1.488(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              1.50
            2              2.00              0.75
            3              3.00              0.00
            4              4.00              0.00
            5              5.00              0.00
            6              6.00              0.00
            7              7.00              0.75
            8              8.00              1.50
      Manning's 'N' friction factor =   0.250
      ------------------------------------------------------------------
      Sub-Channel flow  =      5.950(CFS)
        '     '   flow top width =      5.743(Ft.)
        '     '    velocity=    1.488(Ft/s)
        '     '   area =      3.998(Sq.Ft)
        '     '   Froude number =     0.314

      Upstream point elevation =   184.000(Ft.)
      Downstream point elevation =    95.000(Ft.)
      Flow length =   768.000(Ft.)
      Travel time  =    8.60 min.
      Time of concentration =   15.44 min.
      Depth of flow =   0.936(Ft.)
      Average velocity =   1.488(Ft/s)
      Total irregular channel flow =     5.950(CFS)
      Irregular channel normal depth above invert elev. =   0.936(Ft.)
      Average velocity of channel(s) =   1.488(Ft/s)
```

```
 Adding area flow to channel
Rainfall intensity (I) =      3.311(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      3.311(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      3.235
Subarea runoff =      9.608(CFS) for      7.410(Ac.)
Total runoff =     10.710(CFS)    Total area =       7.890(Ac.)
Depth of flow =   1.280(Ft.), Average velocity =   1.725(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      103.000 to Point/Station
203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
___
Top of street segment elevation =    95.000(Ft.)
End of street segment elevation =    81.680(Ft.)
Length of street segment  =   293.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  12.000(Ft.)
Distance from crown to crossfall grade break  =  10.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   0.000(Ft.)
Gutter hike from flowline =  0.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     11.069(CFS)
Depth of flow =   0.274(Ft.), Average velocity =   5.982(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.000(Ft.)
Flow velocity =   5.98(Ft/s)
Travel time =    0.82 min.     TC =   16.25  min.
 Adding area flow to street
Rainfall intensity (I) =      3.203(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Rainfall intensity =      3.203(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.410  CA =      3.538
      Subarea runoff =      0.622(CFS) for      0.740(Ac.)
      Total runoff =     11.332(CFS)    Total area =       8.630(Ac.)
      Street flow at end of street =     11.332(CFS)
      Half street flow at end of street =     11.332(CFS)
      Depth of flow =   0.276(Ft.), Average velocity =   6.038(Ft/s)
      Note:  depth of flow exceeds top of street crown.
      Flow width (from curb towards crown)=  12.000(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      103.000 to Point/Station
203.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =      8.630(Ac.)
      Runoff from this stream =     11.332(CFS)
      Time of concentration =   16.25 min.
      Rainfall intensity =     3.203(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      201.000 to Point/Station
202.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                   ]
      (24.0 DU/A or Less      )
      Impervious value, Ai = 0.650
      Sub-Area C Value = 0.660
      Initial subarea total flow distance  =   62.000(Ft.)
      Highest elevation =   97.390(Ft.)
      Lowest elevation =   88.700(Ft.)
      Elevation difference =    8.690(Ft.) Slope = 14.016 %
      Top of Initial Area Slope adjusted by User to 14.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  14.00 %, in a development type of
       24.0 DU/A or Less
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.29 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.6600)*( 100.000^.5)/(  14.000^(1/3)]=   3.29
      Calculated TC of    3.286 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.660
      Subarea runoff =      1.356(CFS)
      Total initial stream area =        0.300(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      202.000 to Point/Station
203.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      6.827(CFS)
      Depth of flow =   0.500(Ft.), Average velocity =   4.404(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.90
            2              1.00              0.70
            3              2.00              0.50
            4              3.00              0.40
            5              4.00              0.20
            6              5.00              0.00
            7              6.00              0.00
            8              7.00              0.30
            9              8.00              0.70
            10              9.00              0.90
      Manning's 'N' friction factor =   0.025
      ------------------------------------------------------------------
      Sub-Channel flow  =      6.827(CFS)
        '     '   flow top width =      5.500(Ft.)
        '     '    velocity=    4.404(Ft/s)
        '     '   area =      1.550(Sq.Ft)
        '     '   Froude number =     1.462

      Upstream point elevation =    88.510(Ft.)
      Downstream point elevation =    81.680(Ft.)
      Flow length =   223.000(Ft.)
      Travel time  =    0.84 min.
      Time of concentration =    4.13 min.
      Depth of flow =   0.500(Ft.)
      Average velocity =   4.404(Ft/s)
      Total irregular channel flow =     6.827(CFS)
      Irregular channel normal depth above invert elev. =   0.500(Ft.)
      Average velocity of channel(s) =   4.404(Ft/s)
       Adding area flow to channel
```

```
      Calculated TC of    4.130 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      User specified 'C' value of 0.660 given for subarea
      Rainfall intensity =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.660  CA =      1.795
      Subarea runoff =     10.941(CFS) for      2.420(Ac.)
      Total runoff =     12.298(CFS)    Total area =       2.720(Ac.)
      Depth of flow =   0.635(Ft.), Average velocity =   5.203(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      203.000 to Point/Station
203.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      2.720(Ac.)
      Runoff from this stream =     12.298(CFS)
      Time of concentration =    4.13 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       11.332     16.25             3.203
      2       12.298      4.13             6.850
      Qmax(1) =
              1.000 *    1.000 *    11.332) +
              0.468 *    1.000 *    12.298) + =      17.081
      Qmax(2) =
              1.000 *    0.254 *    11.332) +
              1.000 *    1.000 *    12.298) + =      15.177

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            11.332      12.298
      Maximum flow rates at confluence using above data:
             17.081       15.177
      Area of streams before confluence:
              8.630        2.720
      Results of confluence:
      Total flow rate =     17.081(CFS)
      Time of concentration =    16.252 min.
      Effective stream area after confluence =     11.350(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
```

```
      Process from Point/Station      203.000 to Point/Station
204.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Depth of flow =   2.540(Ft.), Average velocity =   1.388(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              3.00
            2              1.00              0.00
            3              5.00              0.00
            4              6.00              3.00
      Manning's 'N' friction factor =   0.250
      ------------------------------------------------------------------
      Sub-Channel flow  =     17.081(CFS)
        '     '    flow top width =      5.693(Ft.)
        '     '     velocity=    1.388(Ft/s)
        '     '    area =     12.308(Sq.Ft)
        '     '    Froude number =     0.166

      Upstream point elevation =    81.680(Ft.)
      Downstream point elevation =    69.960(Ft.)
      Flow length =   310.000(Ft.)
      Travel time  =    3.72 min.
      Time of concentration =   19.98 min.
      Depth of flow =   2.540(Ft.)
      Average velocity =   1.388(Ft/s)
      Total irregular channel flow =    17.081(CFS)
      Irregular channel normal depth above invert elev. =   2.540(Ft.)
      Average velocity of channel(s) =   1.388(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      204.000 to Point/Station
205.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    69.440(Ft.)
      Downstream point/station elevation =    69.000(Ft.)
      Pipe length  =   105.00(Ft.) Slope =   0.0042  Manning's N = 0.015
      No. of pipes = 1  Required pipe flow  =    17.081(CFS)
      Nearest computed pipe diameter  =     27.00(In.)
      Calculated individual pipe flow  =    17.081(CFS)
      Normal flow depth in pipe =   21.75(In.)
      Flow top width inside pipe =   21.37(In.)
      Critical Depth =   17.32(In.)
      Pipe flow velocity =      4.98(Ft/s)
      Travel time through pipe =    0.35 min.
      Time of concentration (TC) =    20.33 min.
```

```
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      204.000 to Point/Station
205.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =     11.350(Ac.)
      Runoff from this stream =     17.081(CFS)
      Time of concentration =   20.33 min.
      Rainfall intensity =     2.772(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      104.000 to Point/Station
105.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  180.000(Ft.)
      Lowest elevation =  150.000(Ft.)
      Elevation difference =   30.000(Ft.) Slope = 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.00 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  30.000^(1/3)]=   4.00
      Calculated TC of    3.997 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
      Subarea runoff =      0.140(CFS)
      Total initial stream area =        0.050(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      104.000 to Point/Station
205.000
```

```
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____

___
Estimated mean flow rate at midpoint of channel =      0.866(CFS)
Depth of flow =   0.276(Ft.), Average velocity =   0.932(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.50
      2              2.00              0.75
      3              3.00              0.00
      4              4.00              0.00
      5              5.00              0.00
      6              6.00              0.00
      7              7.00              0.75
      8              8.00              1.50
Manning's 'N' friction factor =   0.250
-----------------------------------------------------------------
Sub-Channel flow  =      0.866(CFS)
  '     '   flow top width =      3.736(Ft.)
  '     '    velocity=    0.932(Ft/s)
  '     '   area =      0.929(Sq.Ft)
  '     '   Froude number =     0.329

Upstream point elevation =   150.000(Ft.)
Downstream point elevation =    71.260(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    8.41 min.
Time of concentration =   12.40 min.
Depth of flow =   0.276(Ft.)
Average velocity =   0.932(Ft/s)
Total irregular channel flow =     0.866(CFS)
Irregular channel normal depth above invert elev. =   0.276(Ft.)
Average velocity of channel(s) =   0.932(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      3.812(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      3.812(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.402
Subarea runoff =      1.391(CFS) for      0.930(Ac.)
Total runoff =      1.532(CFS)    Total area =       0.980(Ac.)
Depth of flow =   0.386(Ft.), Average velocity =   1.130(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
 Process from Point/Station      205.000 to Point/Station
205.000
 **** CONFLUENCE OF MINOR STREAMS ****
 ____________________________________________________________________
___
 Along Main Stream number: 1 in normal stream number 2
 Stream flow area =      0.980(Ac.)
 Runoff from this stream =      1.532(CFS)
 Time of concentration =   12.40 min.
 Rainfall intensity =     3.812(In/Hr)
 Summary of stream data:

 Stream   Flow rate      TC            Rainfall Intensity
  No.       (CFS)       (min)                 (In/Hr)


 1       17.081     20.33             2.772
 2        1.532     12.40             3.812
 Qmax(1) =
          1.000 *    1.000 *    17.081) +
          0.727 *    1.000 *     1.532) + =      18.195
 Qmax(2) =
          1.000 *    0.610 *    17.081) +
          1.000 *    1.000 *     1.532) + =      11.956

 Total of 2 streams to confluence:
 Flow rates before confluence point:
       17.081       1.532
 Maximum flow rates at confluence using above data:
        18.195       11.956
 Area of streams before confluence:
        11.350        0.980
 Results of confluence:
 Total flow rate =     18.195(CFS)
 Time of concentration =    20.326 min.
 Effective stream area after confluence =     12.330(Ac.)
 End of computations, total study area =          12.330 (Ac.)
```

APPENDIX C - POST-DEVELOPMENT HYDROLOGY CALCULATIONS

BEFORE DETENTION

```
                San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
            Rational Hydrology Study        Date: 09/04/25
      ------------------------------------------------------------------------
-----
      21-257 Post Development Condition
      100-Year Post Development
      Basin 100-200
      Offsite + onsite
      ------------------------------------------------------------------------
-----
       *********   Hydrology Study Control Information **********

      ------------------------------------------------------------------------
-----


      Program License Serial Number 6144

      ------------------------------------------------------------------------
-----
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  2.600
      24 hour precipitation(inches) =  4.200
      P6/P24 =    61.9%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  190.000(Ft.)
      Lowest elevation =  184.000(Ft.)
```

```
      Elevation difference =    6.000(Ft.) Slope =  6.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   6.00 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   6.83 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   6.000^(1/3)]=   6.83
      Rainfall intensity (I) =      5.599(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
      Subarea runoff =      1.102(CFS)
      Total initial stream area =        0.480(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      102.000 to Point/Station
105.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      5.950(CFS)
      Depth of flow =   0.936(Ft.), Average velocity =   1.488(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              1.50
            2              2.00              0.75
            3              3.00              0.00
            4              4.00              0.00
            5              5.00              0.00
            6              6.00              0.00
            7              7.00              0.75
            8              8.00              1.50
      Manning's 'N' friction factor =   0.250
      ------------------------------------------------------------------
      Sub-Channel flow  =      5.950(CFS)
        '     '   flow top width =      5.743(Ft.)
        '     '    velocity=    1.488(Ft/s)
        '     '   area =      3.998(Sq.Ft)
        '     '   Froude number =     0.314

      Upstream point elevation =   184.000(Ft.)
      Downstream point elevation =    95.000(Ft.)
      Flow length =   768.000(Ft.)
      Travel time  =    8.60 min.
      Time of concentration =   15.44 min.
      Depth of flow =   0.936(Ft.)
      Average velocity =   1.488(Ft/s)
      Total irregular channel flow =     5.950(CFS)
      Irregular channel normal depth above invert elev. =   0.936(Ft.)
      Average velocity of channel(s) =   1.488(Ft/s)
```

```
 Adding area flow to channel
Rainfall intensity (I) =      3.311(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      3.311(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      3.235
Subarea runoff =      9.608(CFS) for      7.410(Ac.)
Total runoff =     10.710(CFS)    Total area =       7.890(Ac.)
Depth of flow =   1.280(Ft.), Average velocity =   1.725(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      105.000 to Point/Station
205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
___
Top of street segment elevation =    95.000(Ft.)
End of street segment elevation =    83.400(Ft.)
Length of street segment  =   140.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  12.000(Ft.)
Distance from crown to crossfall grade break  =  10.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     11.173(CFS)
Depth of flow =   0.378(Ft.), Average velocity =   7.163(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.000(Ft.)
Flow velocity =   7.16(Ft/s)
Travel time =    0.33 min.     TC =   15.76  min.
 Adding area flow to street
Rainfall intensity (I) =      3.267(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Rainfall intensity =      3.267(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.410  CA =      3.538
      Subarea runoff =      0.848(CFS) for      0.740(Ac.)
      Total runoff =     11.558(CFS)    Total area =       8.630(Ac.)
      Street flow at end of street =     11.558(CFS)
      Half street flow at end of street =     11.558(CFS)
      Depth of flow =   0.381(Ft.), Average velocity =   7.260(Ft/s)
      Note:  depth of flow exceeds top of street crown.
      Flow width (from curb towards crown)=  12.000(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      105.000 to Point/Station
205.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =      8.630(Ac.)
      Runoff from this stream =     11.558(CFS)
      Time of concentration =   15.76 min.
      Rainfall intensity =     3.267(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      103.000 to Point/Station
104.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  180.000(Ft.)
      Lowest elevation =  150.000(Ft.)
      Elevation difference =   30.000(Ft.) Slope = 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
```

```
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.00 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  30.000^(1/3)]=   4.00
Calculated TC of    3.997 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.140(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      104.000 to Point/Station
202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
___
Estimated mean flow rate at midpoint of channel =      1.056(CFS)
Depth of flow =   0.303(Ft.), Average velocity =   1.024(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.50
      2              2.00              0.75
      3              3.00              0.00
      4              4.00              0.00
      5              5.00              0.00
      6              6.00              0.00
      7              7.00              0.75
      8              8.00              1.50
Manning's 'N' friction factor =   0.250
-------------------------------------------------------------------
Sub-Channel flow  =      1.056(CFS)
  '     '   flow top width =      3.808(Ft.)
  '     '    velocity=    1.024(Ft/s)
  '     '   area =      1.031(Sq.Ft)
  '     '   Froude number =     0.347

Upstream point elevation =   150.000(Ft.)
Downstream point elevation =    95.570(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    4.88 min.
Time of concentration =    8.88 min.
Depth of flow =   0.303(Ft.)
Average velocity =   1.024(Ft/s)
Total irregular channel flow =     1.056(CFS)
Irregular channel normal depth above invert elev. =   0.303(Ft.)
Average velocity of channel(s) =   1.024(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.729(In/Hr) for a   100.0 year storm
```

```
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Rainfall intensity =      4.729(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.410  CA =      0.402
      Subarea runoff =      1.760(CFS) for      0.930(Ac.)
      Total runoff =      1.900(CFS)    Total area =       0.980(Ac.)
      Depth of flow =   0.427(Ft.), Average velocity =   1.245(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      104.000 to Point/Station
202.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.980(Ac.)
      Runoff from this stream =      1.900(CFS)
      Time of concentration =    8.88 min.
      Rainfall intensity =     4.729(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      201.000 to Point/Station
202.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                   ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   25.000(Ft.)
      Highest elevation =  104.780(Ft.)
      Lowest elevation =   95.570(Ft.)
      Elevation difference =    9.210(Ft.) Slope = 36.840 %
      Top of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       43.0 DU/A or Less
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   1.97 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  30.000^(1/3)]=   1.97
      Calculated TC of    1.970 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.812(CFS)
      Total initial stream area =        0.156(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      202.000 to Point/Station
202.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =      0.156(Ac.)
      Runoff from this stream =      0.812(CFS)
      Time of concentration =    1.97 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1        1.900      8.88             4.729
      2        0.812      1.97             6.850
      Qmax(1) =
               1.000 *    1.000 *     1.900) +
               0.690 *    1.000 *     0.812) + =       2.461
      Qmax(2) =
               1.000 *    0.222 *     1.900) +
               1.000 *    1.000 *     0.812) + =       1.234

      Total of 2 streams to confluence:
      Flow rates before confluence point:
             1.900       0.812
      Maximum flow rates at confluence using above data:
              2.461        1.234
      Area of streams before confluence:
              0.980        0.156
      Results of confluence:
      Total flow rate =      2.461(CFS)
      Time of concentration =     8.881 min.
      Effective stream area after confluence =      1.136(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
```

```
      Process from Point/Station      202.000 to Point/Station
203.000
      **** IMPROVED CHANNEL TRAVEL TIME ****
      ____________________________________________________________________
___
      Upstream point elevation =    95.570(Ft.)
      Downstream point elevation =    91.830(Ft.)
      Channel length thru subarea  =   120.000(Ft.)
      Channel base width     =    0.500(Ft.)
      Slope or 'Z' of left channel bank =   4.000
      Slope or 'Z' of right channel bank =   4.000
      Manning's 'N'    = 0.015
      Maximum depth of channel  =    1.000(Ft.)
      Flow(q) thru subarea =      2.461(CFS)
      Depth of flow =   0.286(Ft.), Average velocity =   5.246(Ft/s)
      Channel flow top width =    2.785(Ft.)
      Flow Velocity =    5.25(Ft/s)
      Travel time  =    0.38 min.
      Time of concentration =    9.26 min.
      Critical depth =      0.414(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      203.000 to Point/Station
205.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    90.000(Ft.)
      Downstream point/station elevation =    82.000(Ft.)
      Pipe length  =   230.00(Ft.) Slope =   0.0348  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     2.461(CFS)
      Nearest computed pipe diameter  =      9.00(In.)
      Calculated individual pipe flow  =     2.461(CFS)
      Normal flow depth in pipe =    6.08(In.)
      Flow top width inside pipe =    8.43(In.)
      Critical Depth =    8.28(In.)
      Pipe flow velocity =      7.75(Ft/s)
      Travel time through pipe =    0.49 min.
      Time of concentration (TC) =     9.76 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      203.000 to Point/Station
205.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 2
      Stream flow area =      1.136(Ac.)
      Runoff from this stream =      2.461(CFS)
```

```
      Time of concentration =    9.76 min.
      Rainfall intensity =     4.451(In/Hr)
      Program is now starting with Main Stream No. 3


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      204.000 to Point/Station
205.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   75.000(Ft.)
      Highest elevation =   84.430(Ft.)
      Lowest elevation =   83.400(Ft.)
      Elevation difference =    1.030(Ft.) Slope =  1.373 %
      Top of Initial Area Slope adjusted by User to  2.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 75.00 (Ft)
      for the top area slope value of   2.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.21 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  75.000^.5)/(   2.000^(1/3)]=   4.21
      Calculated TC of    4.207 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.469(CFS)
      Total initial stream area =        0.090(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      205.000 to Point/Station
205.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 3
      Stream flow area =      0.090(Ac.)
      Runoff from this stream =      0.469(CFS)
      Time of concentration =    4.21 min.
      Rainfall intensity =     6.850(In/Hr)
```

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	11.558	15.76	3.267
2	2.461	9.76	4.451
3	0.469	4.21	6.850

```
Qmax(1) =
         1.000 *    1.000 *    11.558) +
         0.734 *    1.000 *     2.461) +
         0.477 *    1.000 *     0.469) + =      13.588
Qmax(2) =
         1.000 *    0.619 *    11.558) +
         1.000 *    1.000 *     2.461) +
         0.650 *    1.000 *     0.469) + =       9.920
Qmax(3) =
         1.000 *    0.267 *    11.558) +
         1.000 *    0.431 *     2.461) +
         1.000 *    1.000 *     0.469) + =       4.614
```

Total of 3 main streams to confluence:
Flow rates before confluence point:
11.558 2.461 0.469
Maximum flow rates at confluence using above data:
13.588 9.920 4.614
Area of streams before confluence:
8.630 1.136 0.090

Results of confluence:
Total flow rate = 13.588(CFS)
Time of concentration = 15.762 min.
Effective stream area after confluence = 9.856(Ac.)

++
+++
Process from Point/Station 205.000 to Point/Station
207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
___
Upstream point/station elevation = 82.000(Ft.)
Downstream point/station elevation = 81.700(Ft.)
Pipe length = 110.00(Ft.) Slope = 0.0027 Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.588(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 13.588(CFS)
Normal flow depth in pipe = 18.94(In.)
Flow top width inside pipe = 24.71(In.)
Critical Depth = 15.38(In.)
Pipe flow velocity = 4.56(Ft/s)

```
      Travel time through pipe =    0.40 min.
      Time of concentration (TC) =    16.16 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      205.000 to Point/Station
207.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =      9.856(Ac.)
      Runoff from this stream =     13.588(CFS)
      Time of concentration =   16.16 min.
      Rainfall intensity =     3.214(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      206.000 to Point/Station
207.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   28.000(Ft.)
      Highest elevation =   88.370(Ft.)
      Lowest elevation =   83.530(Ft.)
      Elevation difference =    4.840(Ft.) Slope = 17.286 %
      Top of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   1.97 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  30.000^(1/3)]=   1.97
      Calculated TC of    1.970 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.573(CFS)
      Total initial stream area =        0.110(Ac.)
```

```
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      207.000 to Point/Station
207.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.110(Ac.)
      Runoff from this stream =      0.573(CFS)
      Time of concentration =    1.97 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       13.588     16.16              3.214
      2        0.573      1.97              6.850
      Qmax(1) =
               1.000 *    1.000 *    13.588) +
               0.469 *    1.000 *     0.573) + =      13.856
      Qmax(2) =
               1.000 *    0.122 *    13.588) +
               1.000 *    1.000 *     0.573) + =       2.228

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            13.588       0.573
      Maximum flow rates at confluence using above data:
             13.856        2.228
      Area of streams before confluence:
              9.856        0.110
      Results of confluence:
      Total flow rate =     13.856(CFS)
      Time of concentration =    16.164 min.
      Effective stream area after confluence =      9.966(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      207.000 to Point/Station
219.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    74.090(Ft.)
      Downstream point/station elevation =    70.030(Ft.)
      Pipe length  =    85.00(Ft.) Slope =   0.0478  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    13.856(CFS)
      Nearest computed pipe diameter  =     15.00(In.)
      Calculated individual pipe flow  =    13.856(CFS)
      Normal flow depth in pipe =   12.05(In.)
```

```
      Flow top width inside pipe =   11.93(In.)
      Critical depth could not be calculated.
      Pipe flow velocity =     13.11(Ft/s)
      Travel time through pipe =    0.11 min.
      Time of concentration (TC) =    16.27 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      207.000 to Point/Station
219.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =      9.966(Ac.)
      Runoff from this stream =     13.856(CFS)
      Time of concentration =   16.27 min.
      Rainfall intensity =     3.200(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      208.000 to Point/Station
209.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =   94.780(Ft.)
      Lowest elevation =   84.940(Ft.)
      Elevation difference =    9.840(Ft.) Slope =  9.840 %
      Top of Initial Area Slope adjusted by User to  9.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   9.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   2.94 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(   9.000^(1/3)]=   2.94
      Calculated TC of    2.942 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
```

```
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.208(CFS)
      Total initial stream area =        0.040(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      209.000 to Point/Station
210.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
___
      Top of street segment elevation =    84.940(Ft.)
      End of street segment elevation =    83.530(Ft.)
      Length of street segment  =   120.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  12.000(Ft.)
      Distance from crown to crossfall grade break  =  10.500(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [1] side(s) of the street
      Distance from curb to property line  =  10.000(Ft.)
      Slope from curb to property line (v/hz) =   0.020
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  2.000(In.)
       Manning's N in gutter =  0.0150
       Manning's N from gutter to grade break =  0.0150
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =      0.324(CFS)
      Depth of flow =   0.198(Ft.), Average velocity =   1.646(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =   3.070(Ft.)
      Flow velocity =   1.65(Ft/s)
      Travel time =    1.21 min.     TC =    4.16  min.
       Adding area flow to street
      Calculated TC of    4.157 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      User specified 'C' value of 0.740 given for subarea
      Rainfall intensity =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.748  CA =      0.075
      Subarea runoff =      0.304(CFS) for      0.060(Ac.)
      Total runoff =      0.512(CFS)    Total area =       0.100(Ac.)
      Street flow at end of street =      0.512(CFS)
      Half street flow at end of street =      0.512(CFS)
      Depth of flow =   0.225(Ft.), Average velocity =   1.718(Ft/s)
      Flow width (from curb towards crown)=   4.424(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      210.000 to Point/Station
212.000
```

```
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    82.500(Ft.)
      Downstream point/station elevation =    81.000(Ft.)
      Pipe length  =   235.00(Ft.) Slope =   0.0064  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     0.512(CFS)
      Nearest computed pipe diameter  =      9.00(In.)
      Calculated individual pipe flow  =     0.512(CFS)
      Normal flow depth in pipe =    3.89(In.)
      Flow top width inside pipe =    8.92(In.)
      Critical Depth =    3.88(In.)
      Pipe flow velocity =      2.80(Ft/s)
      Travel time through pipe =    1.40 min.
      Time of concentration (TC) =     5.55 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      210.000 to Point/Station
212.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.100(Ac.)
      Runoff from this stream =      0.512(CFS)
      Time of concentration =    5.55 min.
      Rainfall intensity =     6.401(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      211.000 to Point/Station
212.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   73.000(Ft.)
      Highest elevation =   86.760(Ft.)
      Lowest elevation =   83.430(Ft.)
      Elevation difference =    3.330(Ft.) Slope =  4.562 %
      Top of Initial Area Slope adjusted by User to 10.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  10.00 %, in a development type of
```

```
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.84 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  10.000^(1/3)]=   2.84
Calculated TC of    2.841 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
Subarea runoff =      1.822(CFS)
Total initial stream area =        0.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      212.000 to Point/Station
212.000
**** CONFLUENCE OF MINOR STREAMS ****
__________________________________________________________________________
___
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.350(Ac.)
Runoff from this stream =      1.822(CFS)
Time of concentration =    2.84 min.
Rainfall intensity =     6.850(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.512      5.55             6.401
2        1.822      2.84             6.850
Qmax(1) =
         1.000 *    1.000 *     0.512) +
         0.934 *    1.000 *     1.822) + =       2.215
Qmax(2) =
         1.000 *    0.511 *     0.512) +
         1.000 *    1.000 *     1.822) + =       2.084

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.512       1.822
Maximum flow rates at confluence using above data:
        2.215        2.084
Area of streams before confluence:
        0.100        0.350
Results of confluence:
Total flow rate =      2.215(CFS)
Time of concentration =     5.555 min.
Effective stream area after confluence =      0.450(Ac.)
```

```
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      212.000 to Point/Station
217.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    81.000(Ft.)
      Downstream point/station elevation =    80.200(Ft.)
      Pipe length  =   117.00(Ft.) Slope =   0.0068  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     2.215(CFS)
      Nearest computed pipe diameter  =     12.00(In.)
      Calculated individual pipe flow  =     2.215(CFS)
      Normal flow depth in pipe =    7.77(In.)
      Flow top width inside pipe =   11.47(In.)
      Critical Depth =    7.64(In.)
      Pipe flow velocity =      4.12(Ft/s)
      Travel time through pipe =    0.47 min.
      Time of concentration (TC) =     6.03 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      212.000 to Point/Station
217.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.450(Ac.)
      Runoff from this stream =      2.215(CFS)
      Time of concentration =    6.03 min.
      Rainfall intensity =     6.072(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      213.000 to Point/Station
214.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  105.000(Ft.)
      Highest elevation =   84.000(Ft.)
      Lowest elevation =   76.580(Ft.)
      Elevation difference =    7.420(Ft.) Slope =  7.067 %
```

```
      Top of Initial Area Slope adjusted by User to 13.000 %
      Bottom of Initial Area Slope adjusted by User to 13.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  13.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   2.60 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  13.000^(1/3)]=   2.60
      The initial area total distance of  105.00 (Ft.) entered leaves a
      remaining distance of    5.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.06
minutes
      for a distance of   5.00 (Ft.) and a slope of 13.00 %
      with an elevation difference of   0.65(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.059 Minutes
      Tt=[(11.9*0.0009^3)/(  0.65)]^.385=  0.06
      Total initial area Ti =   2.60 minutes from Figure 3-3 formula plus
        0.06 minutes from the Figure 3-4 formula =   2.66 minutes
      Calculated TC of    2.662 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.937(CFS)
      Total initial stream area =        0.180(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      214.000 to Point/Station
217.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ------------------------------------------------------------------
---
      Upstream point/station elevation =    80.350(Ft.)
      Downstream point/station elevation =    80.200(Ft.)
      Pipe length  =    30.00(Ft.) Slope =   0.0050  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     0.937(CFS)
      Nearest computed pipe diameter  =      9.00(In.)
      Calculated individual pipe flow  =     0.937(CFS)
      Normal flow depth in pipe =    6.09(In.)
      Flow top width inside pipe =    8.42(In.)
      Critical Depth =    5.32(In.)
      Pipe flow velocity =      2.94(Ft/s)
      Travel time through pipe =    0.17 min.
      Time of concentration (TC) =     2.83 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
```

```
      Process from Point/Station      214.000 to Point/Station
217.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =      0.180(Ac.)
      Runoff from this stream =      0.937(CFS)
      Time of concentration =    2.83 min.
      Rainfall intensity =     6.850(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      215.000 to Point/Station
216.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  110.000(Ft.)
      Highest elevation =   84.500(Ft.)
      Lowest elevation =   84.300(Ft.)
      Elevation difference =    0.200(Ft.) Slope =  0.182 %
      Top of Initial Area Slope adjusted by User to  1.000 %
      Bottom of Initial Area Slope adjusted by User to  1.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 65.00 (Ft)
      for the top area slope value of   1.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.93 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  65.000^.5)/(   1.000^(1/3)]=   4.93
      The initial area total distance of  110.00 (Ft.) entered leaves a
      remaining distance of   45.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.86
minutes
      for a distance of  45.00 (Ft.) and a slope of  1.00 %
      with an elevation difference of   0.45(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.862 Minutes
      Tt=[(11.9*0.0085^3)/(  0.45)]^.385=  0.86
      Total initial area Ti =   4.93 minutes from Figure 3-3 formula plus
        0.86 minutes from the Figure 3-4 formula =   5.80 minutes
      Rainfall intensity (I) =      6.228(In/Hr) for a   100.0 year storm
```

```
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      3.786(CFS)
      Total initial stream area =        0.800(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      216.000 to Point/Station
217.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    80.510(Ft.)
      Downstream point/station elevation =    80.200(Ft.)
      Pipe length  =    61.00(Ft.) Slope =   0.0051  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     3.786(CFS)
      Nearest computed pipe diameter  =     15.00(In.)
      Calculated individual pipe flow  =     3.786(CFS)
      Normal flow depth in pipe =   10.36(In.)
      Flow top width inside pipe =   13.87(In.)
      Critical Depth =    9.43(In.)
      Pipe flow velocity =      4.19(Ft/s)
      Travel time through pipe =    0.24 min.
      Time of concentration (TC) =     6.04 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      217.000 to Point/Station
217.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 3
      Stream flow area =      0.800(Ac.)
      Runoff from this stream =      3.786(CFS)
      Time of concentration =    6.04 min.
      Rainfall intensity =     6.065(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1        2.215      6.03             6.072
      2        0.937      2.83             6.850
      3        3.786      6.04             6.065
      Qmax(1) =
               1.000 *    1.000 *     2.215) +
               0.886 *    1.000 *     0.937) +
               1.000 *    0.998 *     3.786) + =       6.825
      Qmax(2) =
               1.000 *    0.470 *     2.215) +
               1.000 *    1.000 *     0.937) +
```

```
         1.000 *    0.469 *     3.786) + =       3.753
     Qmax(3) =
         0.999 *    1.000 *     2.215) +
         0.885 *    1.000 *     0.937) +
         1.000 *    1.000 *     3.786) + =       6.829

     Total of 3 streams to confluence:
     Flow rates before confluence point:
           2.215       0.937       3.786
     Maximum flow rates at confluence using above data:
         6.825        3.753        6.829
     Area of streams before confluence:
         0.450        0.180        0.800
     Results of confluence:
     Total flow rate =      6.829(CFS)
     Time of concentration =     6.039 min.
     Effective stream area after confluence =      1.430(Ac.)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      217.000 to Point/Station
219.000
     **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
     ______________________________________________________________________
___
     Upstream point/station elevation =    80.200(Ft.)
     Downstream point/station elevation =    70.030(Ft.)
     Pipe length  =   110.00(Ft.) Slope =   0.0925  Manning's N = 0.013
     No. of pipes = 1  Required pipe flow  =     6.829(CFS)
     Nearest computed pipe diameter  =     12.00(In.)
     Calculated individual pipe flow  =     6.829(CFS)
     Normal flow depth in pipe =    6.91(In.)
     Flow top width inside pipe =   11.86(In.)
     Critical depth could not be calculated.
     Pipe flow velocity =     14.59(Ft/s)
     Travel time through pipe =    0.13 min.
     Time of concentration (TC) =     6.16 min.


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      219.000 to Point/Station
219.000
     **** CONFLUENCE OF MAIN STREAMS ****
     ______________________________________________________________________
___
     The following data inside Main Stream is listed:
     In Main Stream number: 2
     Stream flow area =      1.430(Ac.)
     Runoff from this stream =      6.829(CFS)
     Time of concentration =    6.16 min.
     Rainfall intensity =     5.985(In/Hr)
     Summary of stream data:
```

```
      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       13.856     16.27             3.200
      2        6.829      6.16             5.985
      Qmax(1) =
               1.000 *    1.000 *    13.856) +
               0.535 *    1.000 *     6.829) + =      17.508
      Qmax(2) =
               1.000 *    0.379 *    13.856) +
               1.000 *    1.000 *     6.829) + =      12.078

      Total of 2 main streams to confluence:
      Flow rates before confluence point:
            13.856       6.829
      Maximum flow rates at confluence using above data:
             17.508       12.078
      Area of streams before confluence:
              9.966        1.430


      Results of confluence:
      Total flow rate =     17.508(CFS)
      Time of concentration =    16.272 min.
      Effective stream area after confluence  =     11.396(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      219.000 to Point/Station
220.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    70.030(Ft.)
      Downstream point/station elevation =    69.440(Ft.)
      Pipe length  =   117.00(Ft.) Slope =   0.0050  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    17.508(CFS)
      Nearest computed pipe diameter  =     27.00(In.)
      Calculated individual pipe flow  =    17.508(CFS)
      Normal flow depth in pipe =   18.21(In.)
      Flow top width inside pipe =   25.30(In.)
      Critical Depth =   17.53(In.)
      Pipe flow velocity =      6.14(Ft/s)
      Travel time through pipe =    0.32 min.
      Time of concentration (TC) =    16.59 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      219.000 to Point/Station
220.000
```

```
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =     11.396(Ac.)
      Runoff from this stream =     17.508(CFS)
      Time of concentration =   16.59 min.
      Rainfall intensity =     3.160(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      218.000 to Point/Station
220.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   33.000(Ft.)
      Highest elevation =   84.760(Ft.)
      Lowest elevation =   71.720(Ft.)
      Elevation difference =   13.040(Ft.) Slope = 39.515 %
      Top of Initial Area Slope adjusted by User to 13.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  13.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Table 3-2
      Initial Area Time of Concentration =   2.70 minutes
       (for slope value of  10.00 %)
      Calculated TC of    2.700 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      1.093(CFS)
      Total initial stream area =        0.210(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      220.000 to Point/Station
220.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.210(Ac.)
```

```
      Runoff from this stream =      1.093(CFS)
      Time of concentration =    2.70 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       17.508     16.59             3.160
      2        1.093      2.70             6.850
      Qmax(1) =
               1.000 *    1.000 *    17.508) +
               0.461 *    1.000 *     1.093) + =      18.012
      Qmax(2) =
               1.000 *    0.163 *    17.508) +
               1.000 *    1.000 *     1.093) + =       3.943

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            17.508       1.093
      Maximum flow rates at confluence using above data:
             18.012        3.943
      Area of streams before confluence:
             11.396        0.210
      Results of confluence:
      Total flow rate =     18.012(CFS)
      Time of concentration =    16.590 min.
      Effective stream area after confluence =     11.606(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      220.000 to Point/Station
226.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    69.440(Ft.)
      Downstream point/station elevation =    69.000(Ft.)
      Pipe length  =    88.00(Ft.) Slope =   0.0050  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    18.012(CFS)
      Nearest computed pipe diameter  =     27.00(In.)
      Calculated individual pipe flow  =    18.012(CFS)
      Normal flow depth in pipe =   18.66(In.)
      Flow top width inside pipe =   24.95(In.)
      Critical Depth =   17.80(In.)
      Pipe flow velocity =      6.15(Ft/s)
      Travel time through pipe =    0.24 min.
      Time of concentration (TC) =    16.83 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
```

```
      Process from Point/Station      220.000 to Point/Station
226.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =     11.606(Ac.)
      Runoff from this stream =     18.012(CFS)
      Time of concentration =   16.83 min.
      Rainfall intensity =     3.132(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      221.000 to Point/Station
222.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  125.000(Ft.)
      Highest elevation =   77.000(Ft.)
      Lowest elevation =   69.540(Ft.)
      Elevation difference =    7.460(Ft.) Slope =  5.968 %
      Top of Initial Area Slope adjusted by User to  5.000 %
      Bottom of Initial Area Slope adjusted by User to  5.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 95.00 (Ft)
      for the top area slope value of   5.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.49 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  95.000^.5)/(   5.000^(1/3)]=   3.49
      The initial area total distance of  125.00 (Ft.) entered leaves a
      remaining distance of   30.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.34
minutes
      for a distance of  30.00 (Ft.) and a slope of  5.00 %
      with an elevation difference of   1.50(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.340 Minutes
      Tt=[(11.9*0.0057^3)/(  1.50)]^.385=  0.34
      Total initial area Ti =   3.49 minutes from Figure 3-3 formula plus
```

```
       0.34 minutes from the Figure 3-4 formula =   3.83 minutes
     Calculated TC of    3.828 minutes is less than 5 minutes,
      resetting TC to 5.0 minutes for rainfall intensity calculations
     Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
     Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
     Subarea runoff =      1.458(CFS)
     Total initial stream area =        0.280(Ac.)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      222.000 to Point/Station
225.000
     **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
     ______________________________________________________________________
___
     Upstream point/station elevation =    69.800(Ft.)
     Downstream point/station elevation =    69.500(Ft.)
     Pipe length  =    50.00(Ft.) Slope =   0.0060  Manning's N = 0.013
     No. of pipes = 1  Required pipe flow  =     1.458(CFS)
     Nearest computed pipe diameter  =     12.00(In.)
     Calculated individual pipe flow  =     1.458(CFS)
     Normal flow depth in pipe =    6.20(In.)
     Flow top width inside pipe =   11.99(In.)
     Critical Depth =    6.14(In.)
     Pipe flow velocity =      3.56(Ft/s)
     Travel time through pipe =    0.23 min.
     Time of concentration (TC) =     4.06 min.


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      222.000 to Point/Station
225.000
     **** CONFLUENCE OF MINOR STREAMS ****
     ______________________________________________________________________
___
     Along Main Stream number: 2 in normal stream number 1
     Stream flow area =      0.280(Ac.)
     Runoff from this stream =      1.458(CFS)
     Time of concentration =    4.06 min.
     Rainfall intensity =     6.850(In/Hr)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      223.000 to Point/Station
224.000
     **** INITIAL AREA EVALUATION ****
     ______________________________________________________________________
___
     Decimal fraction soil group A = 1.000
     Decimal fraction soil group B = 0.000
     Decimal fraction soil group C = 0.000
```

```
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   87.000(Ft.)
      Highest elevation =   86.330(Ft.)
      Lowest elevation =   83.670(Ft.)
      Elevation difference =    2.660(Ft.) Slope =  3.057 %
      Top of Initial Area Slope adjusted by User to  3.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 85.00 (Ft)
      for the top area slope value of   3.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.91 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  85.000^.5)/(   3.000^(1/3)]=   3.91
      Calculated TC of    3.912 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.677(CFS)
      Total initial stream area =        0.130(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      224.000 to Point/Station
225.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      1.494(CFS)
      Depth of flow =   0.164(Ft.), Average velocity =   5.982(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.50
            2              1.00              0.40
            3              2.00              0.30
            4              3.00              0.10
            5              4.00              0.00
            6              5.00              0.10
            7              6.00              0.30
            8              7.00              0.40
      Manning's 'N' friction factor =   0.015
      ------------------------------------------------------------------
      Sub-Channel flow  =      1.494(CFS)
        '     '   flow top width =      2.645(Ft.)
        '     '    velocity=    5.982(Ft/s)
        '     '   area =      0.250(Sq.Ft)
        '     '   Froude number =     3.430
```

```
      Upstream point elevation =    83.670(Ft.)
      Downstream point elevation =    71.580(Ft.)
      Flow length =   141.000(Ft.)
      Travel time  =    0.39 min.
      Time of concentration =    4.31 min.
      Depth of flow =   0.164(Ft.)
      Average velocity =   5.982(Ft/s)
      Total irregular channel flow =     1.494(CFS)
      Irregular channel normal depth above invert elev. =   0.164(Ft.)
      Average velocity of channel(s) =   5.982(Ft/s)
       Adding area flow to channel
      Calculated TC of    4.305 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      User specified 'C' value of 0.740 given for subarea
      Rainfall intensity =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.746  CA =      0.331
      Subarea runoff =      1.592(CFS) for      0.314(Ac.)
      Total runoff =      2.269(CFS)    Total area =       0.444(Ac.)
      Depth of flow =   0.195(Ft.), Average velocity =   6.763(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      225.000 to Point/Station
225.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =      0.444(Ac.)
      Runoff from this stream =      2.269(CFS)
      Time of concentration =    4.31 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1        1.458      4.06             6.850
      2        2.269      4.31             6.850
      Qmax(1) =
              1.000 *    1.000 *     1.458) +
              1.000 *    0.944 *     2.269) + =       3.598
      Qmax(2) =
              1.000 *    1.000 *     1.458) +
              1.000 *    1.000 *     2.269) + =       3.726

      Total of 2 streams to confluence:
      Flow rates before confluence point:
             1.458       2.269
```

```
      Maximum flow rates at confluence using above data:
              3.598        3.726
      Area of streams before confluence:
              0.280        0.444
      Results of confluence:
      Total flow rate =      3.726(CFS)
      Time of concentration =     4.305 min.
      Effective stream area after confluence =      0.724(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      225.000 to Point/Station
226.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ______________________________________________________________________
___
      Upstream point/station elevation =    69.500(Ft.)
      Downstream point/station elevation =    69.000(Ft.)
      Pipe length  =    60.00(Ft.) Slope =   0.0083  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     3.726(CFS)
      Nearest computed pipe diameter  =     15.00(In.)
      Calculated individual pipe flow  =     3.726(CFS)
      Normal flow depth in pipe =    8.65(In.)
      Flow top width inside pipe =   14.82(In.)
      Critical Depth =    9.36(In.)
      Pipe flow velocity =      5.08(Ft/s)
      Travel time through pipe =    0.20 min.
      Time of concentration (TC) =     4.50 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      226.000 to Point/Station
226.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ______________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 2
      Stream flow area =      0.724(Ac.)
      Runoff from this stream =      3.726(CFS)
      Time of concentration =    4.50 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       18.012     16.83             3.132
      2        3.726      4.50             6.850
      Qmax(1) =
               1.000 *    1.000 *    18.012) +
```

```
         0.457 *    1.000 *     3.726) + =      19.715
Qmax(2) =
         1.000 *    0.268 *    18.012) +
         1.000 *    1.000 *     3.726) + =       8.545

Total of 2 main streams to confluence:
Flow rates before confluence point:
      18.012       3.726
Maximum flow rates at confluence using above data:
       19.715        8.545
Area of streams before confluence:
       11.606        0.724


Results of confluence:
Total flow rate =     19.715(CFS)
Time of concentration =    16.828 min.
Effective stream area after confluence  =     12.330(Ac.)
End of computations, total study area =          12.330 (Ac.)
```

AFTER DETENTION

```
                San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2006 Version 7.7

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
            Rational Hydrology Study        Date: 09/08/25
      ------------------------------------------------------------------------
-----
      21-257 Post Development Condition
      100-Year Post Development
      Basin 100-200
      Offsite + onsite
      ------------------------------------------------------------------------
-----
       *********   Hydrology Study Control Information **********

      ------------------------------------------------------------------------
-----


      Program License Serial Number 6144

      ------------------------------------------------------------------------
-----
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  2.600
      24 hour precipitation(inches) =  4.200
      P6/P24 =    61.9%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  190.000(Ft.)
      Lowest elevation =  184.000(Ft.)
```

```
      Elevation difference =    6.000(Ft.) Slope =  6.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   6.00 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   6.83 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(   6.000^(1/3)]=   6.83
      Rainfall intensity (I) =      5.599(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
      Subarea runoff =      1.102(CFS)
      Total initial stream area =        0.480(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      102.000 to Point/Station
105.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      5.950(CFS)
      Depth of flow =   0.936(Ft.), Average velocity =   1.488(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              1.50
            2              2.00              0.75
            3              3.00              0.00
            4              4.00              0.00
            5              5.00              0.00
            6              6.00              0.00
            7              7.00              0.75
            8              8.00              1.50
      Manning's 'N' friction factor =   0.250
      ------------------------------------------------------------------
      Sub-Channel flow  =      5.950(CFS)
        '     '   flow top width =      5.743(Ft.)
        '     '    velocity=    1.488(Ft/s)
        '     '   area =      3.998(Sq.Ft)
        '     '   Froude number =     0.314

      Upstream point elevation =   184.000(Ft.)
      Downstream point elevation =    95.000(Ft.)
      Flow length =   768.000(Ft.)
      Travel time  =    8.60 min.
      Time of concentration =   15.44 min.
      Depth of flow =   0.936(Ft.)
      Average velocity =   1.488(Ft/s)
      Total irregular channel flow =     5.950(CFS)
      Irregular channel normal depth above invert elev. =   0.936(Ft.)
      Average velocity of channel(s) =   1.488(Ft/s)
```

```
 Adding area flow to channel
Rainfall intensity (I) =      3.311(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      3.311(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      3.235
Subarea runoff =      9.608(CFS) for      7.410(Ac.)
Total runoff =     10.710(CFS)    Total area =       7.890(Ac.)
Depth of flow =   1.280(Ft.), Average velocity =   1.725(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      105.000 to Point/Station
205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
___
Top of street segment elevation =    95.000(Ft.)
End of street segment elevation =    83.400(Ft.)
Length of street segment  =   140.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  12.000(Ft.)
Distance from crown to crossfall grade break  =  10.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     11.173(CFS)
Depth of flow =   0.378(Ft.), Average velocity =   7.163(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.000(Ft.)
Flow velocity =   7.16(Ft/s)
Travel time =    0.33 min.     TC =   15.76  min.
 Adding area flow to street
Rainfall intensity (I) =      3.267(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Rainfall intensity =      3.267(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.410  CA =      3.538
      Subarea runoff =      0.848(CFS) for      0.740(Ac.)
      Total runoff =     11.558(CFS)    Total area =       8.630(Ac.)
      Street flow at end of street =     11.558(CFS)
      Half street flow at end of street =     11.558(CFS)
      Depth of flow =   0.381(Ft.), Average velocity =   7.260(Ft/s)
      Note:  depth of flow exceeds top of street crown.
      Flow width (from curb towards crown)=  12.000(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      105.000 to Point/Station
205.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =      8.630(Ac.)
      Runoff from this stream =     11.558(CFS)
      Time of concentration =   15.76 min.
      Rainfall intensity =     3.267(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      103.000 to Point/Station
104.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  180.000(Ft.)
      Lowest elevation =  150.000(Ft.)
      Elevation difference =   30.000(Ft.) Slope = 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
```

```
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.00 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  30.000^(1/3)]=   4.00
Calculated TC of    3.997 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.140(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      104.000 to Point/Station
202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
___
Estimated mean flow rate at midpoint of channel =      1.056(CFS)
Depth of flow =   0.303(Ft.), Average velocity =   1.024(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.50
      2              2.00              0.75
      3              3.00              0.00
      4              4.00              0.00
      5              5.00              0.00
      6              6.00              0.00
      7              7.00              0.75
      8              8.00              1.50
Manning's 'N' friction factor =   0.250
-------------------------------------------------------------------
Sub-Channel flow  =      1.056(CFS)
  '     '   flow top width =      3.808(Ft.)
  '     '    velocity=    1.024(Ft/s)
  '     '   area =      1.031(Sq.Ft)
  '     '   Froude number =     0.347

Upstream point elevation =   150.000(Ft.)
Downstream point elevation =    95.570(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    4.88 min.
Time of concentration =    8.88 min.
Depth of flow =   0.303(Ft.)
Average velocity =   1.024(Ft/s)
Total irregular channel flow =     1.056(CFS)
Irregular channel normal depth above invert elev. =   0.303(Ft.)
Average velocity of channel(s) =   1.024(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.729(In/Hr) for a   100.0 year storm
```

```
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Rainfall intensity =      4.729(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.410  CA =      0.402
      Subarea runoff =      1.760(CFS) for      0.930(Ac.)
      Total runoff =      1.900(CFS)    Total area =       0.980(Ac.)
      Depth of flow =   0.427(Ft.), Average velocity =   1.245(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      104.000 to Point/Station
202.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.980(Ac.)
      Runoff from this stream =      1.900(CFS)
      Time of concentration =    8.88 min.
      Rainfall intensity =     4.729(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      201.000 to Point/Station
202.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                   ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   25.000(Ft.)
      Highest elevation =  104.780(Ft.)
      Lowest elevation =   95.570(Ft.)
      Elevation difference =    9.210(Ft.) Slope = 36.840 %
      Top of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       43.0 DU/A or Less
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   1.97 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  30.000^(1/3)]=   1.97
      Calculated TC of    1.970 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.812(CFS)
      Total initial stream area =        0.156(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      202.000 to Point/Station
202.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =      0.156(Ac.)
      Runoff from this stream =      0.812(CFS)
      Time of concentration =    1.97 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1        1.900      8.88             4.729
      2        0.812      1.97             6.850
      Qmax(1) =
               1.000 *    1.000 *     1.900) +
               0.690 *    1.000 *     0.812) + =       2.461
      Qmax(2) =
               1.000 *    0.222 *     1.900) +
               1.000 *    1.000 *     0.812) + =       1.234

      Total of 2 streams to confluence:
      Flow rates before confluence point:
             1.900       0.812
      Maximum flow rates at confluence using above data:
              2.461        1.234
      Area of streams before confluence:
              0.980        0.156
      Results of confluence:
      Total flow rate =      2.461(CFS)
      Time of concentration =     8.881 min.
      Effective stream area after confluence =      1.136(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
```

```
      Process from Point/Station      202.000 to Point/Station
203.000
      **** IMPROVED CHANNEL TRAVEL TIME ****
      ____________________________________________________________________
___
      Upstream point elevation =    95.570(Ft.)
      Downstream point elevation =    91.830(Ft.)
      Channel length thru subarea  =   120.000(Ft.)
      Channel base width     =    0.500(Ft.)
      Slope or 'Z' of left channel bank =   4.000
      Slope or 'Z' of right channel bank =   4.000
      Manning's 'N'    = 0.015
      Maximum depth of channel  =    1.000(Ft.)
      Flow(q) thru subarea =      2.461(CFS)
      Depth of flow =   0.286(Ft.), Average velocity =   5.246(Ft/s)
      Channel flow top width =    2.785(Ft.)
      Flow Velocity =    5.25(Ft/s)
      Travel time  =    0.38 min.
      Time of concentration =    9.26 min.
      Critical depth =      0.414(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      203.000 to Point/Station
205.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    90.000(Ft.)
      Downstream point/station elevation =    82.000(Ft.)
      Pipe length  =   230.00(Ft.) Slope =   0.0348  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     2.461(CFS)
      Nearest computed pipe diameter  =      9.00(In.)
      Calculated individual pipe flow  =     2.461(CFS)
      Normal flow depth in pipe =    6.08(In.)
      Flow top width inside pipe =    8.43(In.)
      Critical Depth =    8.28(In.)
      Pipe flow velocity =      7.75(Ft/s)
      Travel time through pipe =    0.49 min.
      Time of concentration (TC) =     9.76 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      203.000 to Point/Station
205.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 2
      Stream flow area =      1.136(Ac.)
      Runoff from this stream =      2.461(CFS)
```

```
      Time of concentration =    9.76 min.
      Rainfall intensity =     4.451(In/Hr)
      Program is now starting with Main Stream No. 3


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      204.000 to Point/Station
205.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   75.000(Ft.)
      Highest elevation =   84.430(Ft.)
      Lowest elevation =   83.400(Ft.)
      Elevation difference =    1.030(Ft.) Slope =  1.373 %
      Top of Initial Area Slope adjusted by User to  2.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 75.00 (Ft)
      for the top area slope value of   2.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.21 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  75.000^.5)/(   2.000^(1/3)]=   4.21
      Calculated TC of    4.207 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.469(CFS)
      Total initial stream area =        0.090(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      205.000 to Point/Station
205.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 3
      Stream flow area =      0.090(Ac.)
      Runoff from this stream =      0.469(CFS)
      Time of concentration =    4.21 min.
      Rainfall intensity =     6.850(In/Hr)
```

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	11.558	15.76	3.267
2	2.461	9.76	4.451
3	0.469	4.21	6.850

```
Qmax(1) =
         1.000 *    1.000 *    11.558) +
         0.734 *    1.000 *     2.461) +
         0.477 *    1.000 *     0.469) + =      13.588
Qmax(2) =
         1.000 *    0.619 *    11.558) +
         1.000 *    1.000 *     2.461) +
         0.650 *    1.000 *     0.469) + =       9.920
Qmax(3) =
         1.000 *    0.267 *    11.558) +
         1.000 *    0.431 *     2.461) +
         1.000 *    1.000 *     0.469) + =       4.614
```

Total of 3 main streams to confluence:
Flow rates before confluence point:
11.558 2.461 0.469
Maximum flow rates at confluence using above data:
13.588 9.920 4.614
Area of streams before confluence:
8.630 1.136 0.090

Results of confluence:
Total flow rate = 13.588(CFS)
Time of concentration = 15.762 min.
Effective stream area after confluence = 9.856(Ac.)

++
+++
Process from Point/Station 205.000 to Point/Station
207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
___
Upstream point/station elevation = 82.000(Ft.)
Downstream point/station elevation = 81.700(Ft.)
Pipe length = 110.00(Ft.) Slope = 0.0027 Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.588(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 13.588(CFS)
Normal flow depth in pipe = 18.94(In.)
Flow top width inside pipe = 24.71(In.)
Critical Depth = 15.38(In.)
Pipe flow velocity = 4.56(Ft/s)

```
      Travel time through pipe =    0.40 min.
      Time of concentration (TC) =    16.16 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      205.000 to Point/Station
207.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =      9.856(Ac.)
      Runoff from this stream =     13.588(CFS)
      Time of concentration =   16.16 min.
      Rainfall intensity =     3.214(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      206.000 to Point/Station
207.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   28.000(Ft.)
      Highest elevation =   88.370(Ft.)
      Lowest elevation =   83.530(Ft.)
      Elevation difference =    4.840(Ft.) Slope = 17.286 %
      Top of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   1.97 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  30.000^(1/3)]=   1.97
      Calculated TC of    1.970 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.573(CFS)
      Total initial stream area =        0.110(Ac.)
```

```
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      207.000 to Point/Station
207.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.110(Ac.)
      Runoff from this stream =      0.573(CFS)
      Time of concentration =    1.97 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       13.588     16.16              3.214
      2        0.573      1.97              6.850
      Qmax(1) =
               1.000 *    1.000 *    13.588) +
               0.469 *    1.000 *     0.573) + =      13.856
      Qmax(2) =
               1.000 *    0.122 *    13.588) +
               1.000 *    1.000 *     0.573) + =       2.228

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            13.588       0.573
      Maximum flow rates at confluence using above data:
             13.856        2.228
      Area of streams before confluence:
              9.856        0.110
      Results of confluence:
      Total flow rate =     13.856(CFS)
      Time of concentration =    16.164 min.
      Effective stream area after confluence =      9.966(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      207.000 to Point/Station
219.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    74.090(Ft.)
      Downstream point/station elevation =    70.030(Ft.)
      Pipe length  =    85.00(Ft.) Slope =   0.0478  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    13.856(CFS)
      Nearest computed pipe diameter  =     15.00(In.)
      Calculated individual pipe flow  =    13.856(CFS)
      Normal flow depth in pipe =   12.05(In.)
```

```
      Flow top width inside pipe =   11.93(In.)
      Critical depth could not be calculated.
      Pipe flow velocity =     13.11(Ft/s)
      Travel time through pipe =    0.11 min.
      Time of concentration (TC) =    16.27 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      207.000 to Point/Station
219.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =      9.966(Ac.)
      Runoff from this stream =     13.856(CFS)
      Time of concentration =   16.27 min.
      Rainfall intensity =     3.200(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      208.000 to Point/Station
209.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =   94.780(Ft.)
      Lowest elevation =   84.940(Ft.)
      Elevation difference =    9.840(Ft.) Slope =  9.840 %
      Top of Initial Area Slope adjusted by User to  9.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   9.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   2.94 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(   9.000^(1/3)]=   2.94
      Calculated TC of    2.942 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
```

```
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.208(CFS)
      Total initial stream area =        0.040(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      209.000 to Point/Station
210.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
___
      Top of street segment elevation =    84.940(Ft.)
      End of street segment elevation =    83.530(Ft.)
      Length of street segment  =   120.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  12.000(Ft.)
      Distance from crown to crossfall grade break  =  10.500(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [1] side(s) of the street
      Distance from curb to property line  =  10.000(Ft.)
      Slope from curb to property line (v/hz) =   0.020
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  2.000(In.)
       Manning's N in gutter =  0.0150
       Manning's N from gutter to grade break =  0.0150
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =      0.324(CFS)
      Depth of flow =   0.198(Ft.), Average velocity =   1.646(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =   3.070(Ft.)
      Flow velocity =   1.65(Ft/s)
      Travel time =    1.21 min.     TC =    4.16  min.
       Adding area flow to street
      Calculated TC of    4.157 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      User specified 'C' value of 0.740 given for subarea
      Rainfall intensity =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.748  CA =      0.075
      Subarea runoff =      0.304(CFS) for      0.060(Ac.)
      Total runoff =      0.512(CFS)    Total area =       0.100(Ac.)
      Street flow at end of street =      0.512(CFS)
      Half street flow at end of street =      0.512(CFS)
      Depth of flow =   0.225(Ft.), Average velocity =   1.718(Ft/s)
      Flow width (from curb towards crown)=   4.424(Ft.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      210.000 to Point/Station
212.000
```

```
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    82.500(Ft.)
      Downstream point/station elevation =    81.000(Ft.)
      Pipe length  =   235.00(Ft.) Slope =   0.0064  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     0.512(CFS)
      Nearest computed pipe diameter  =      9.00(In.)
      Calculated individual pipe flow  =     0.512(CFS)
      Normal flow depth in pipe =    3.89(In.)
      Flow top width inside pipe =    8.92(In.)
      Critical Depth =    3.88(In.)
      Pipe flow velocity =      2.80(Ft/s)
      Travel time through pipe =    1.40 min.
      Time of concentration (TC) =     5.55 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      210.000 to Point/Station
212.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.100(Ac.)
      Runoff from this stream =      0.512(CFS)
      Time of concentration =    5.55 min.
      Rainfall intensity =     6.401(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      211.000 to Point/Station
212.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   73.000(Ft.)
      Highest elevation =   86.760(Ft.)
      Lowest elevation =   83.430(Ft.)
      Elevation difference =    3.330(Ft.) Slope =  4.562 %
      Top of Initial Area Slope adjusted by User to 10.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  10.00 %, in a development type of
```

```
 43.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.84 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  10.000^(1/3)]=   2.84
Calculated TC of    2.841 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
Subarea runoff =      1.822(CFS)
Total initial stream area =        0.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      212.000 to Point/Station
212.000
**** CONFLUENCE OF MINOR STREAMS ****
__________________________________________________________________________
___
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.350(Ac.)
Runoff from this stream =      1.822(CFS)
Time of concentration =    2.84 min.
Rainfall intensity =     6.850(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        0.512      5.55             6.401
2        1.822      2.84             6.850
Qmax(1) =
         1.000 *    1.000 *     0.512) +
         0.934 *    1.000 *     1.822) + =       2.215
Qmax(2) =
         1.000 *    0.511 *     0.512) +
         1.000 *    1.000 *     1.822) + =       2.084

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.512       1.822
Maximum flow rates at confluence using above data:
        2.215        2.084
Area of streams before confluence:
        0.100        0.350
Results of confluence:
Total flow rate =      2.215(CFS)
Time of concentration =     5.555 min.
Effective stream area after confluence =      0.450(Ac.)
```

```
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      212.000 to Point/Station
217.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    81.000(Ft.)
      Downstream point/station elevation =    80.200(Ft.)
      Pipe length  =   117.00(Ft.) Slope =   0.0068  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     2.215(CFS)
      Nearest computed pipe diameter  =     12.00(In.)
      Calculated individual pipe flow  =     2.215(CFS)
      Normal flow depth in pipe =    7.77(In.)
      Flow top width inside pipe =   11.47(In.)
      Critical Depth =    7.64(In.)
      Pipe flow velocity =      4.12(Ft/s)
      Travel time through pipe =    0.47 min.
      Time of concentration (TC) =     6.03 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      212.000 to Point/Station
217.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.450(Ac.)
      Runoff from this stream =      2.215(CFS)
      Time of concentration =    6.03 min.
      Rainfall intensity =     6.072(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      213.000 to Point/Station
214.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  105.000(Ft.)
      Highest elevation =   84.000(Ft.)
      Lowest elevation =   76.580(Ft.)
      Elevation difference =    7.420(Ft.) Slope =  7.067 %
```

```
      Top of Initial Area Slope adjusted by User to 13.000 %
      Bottom of Initial Area Slope adjusted by User to 13.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  13.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   2.60 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*( 100.000^.5)/(  13.000^(1/3)]=   2.60
      The initial area total distance of  105.00 (Ft.) entered leaves a
      remaining distance of    5.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.06
minutes
      for a distance of   5.00 (Ft.) and a slope of 13.00 %
      with an elevation difference of   0.65(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.059 Minutes
      Tt=[(11.9*0.0009^3)/(  0.65)]^.385=  0.06
      Total initial area Ti =   2.60 minutes from Figure 3-3 formula plus
        0.06 minutes from the Figure 3-4 formula =   2.66 minutes
      Calculated TC of    2.662 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.937(CFS)
      Total initial stream area =        0.180(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      214.000 to Point/Station
217.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ------------------------------------------------------------------
---
      Upstream point/station elevation =    80.350(Ft.)
      Downstream point/station elevation =    80.200(Ft.)
      Pipe length  =    30.00(Ft.) Slope =   0.0050  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     0.937(CFS)
      Nearest computed pipe diameter  =      9.00(In.)
      Calculated individual pipe flow  =     0.937(CFS)
      Normal flow depth in pipe =    6.09(In.)
      Flow top width inside pipe =    8.42(In.)
      Critical Depth =    5.32(In.)
      Pipe flow velocity =      2.94(Ft/s)
      Travel time through pipe =    0.17 min.
      Time of concentration (TC) =     2.83 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
```

```
      Process from Point/Station      214.000 to Point/Station
217.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =      0.180(Ac.)
      Runoff from this stream =      0.937(CFS)
      Time of concentration =    2.83 min.
      Rainfall intensity =     6.850(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      215.000 to Point/Station
216.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  110.000(Ft.)
      Highest elevation =   84.500(Ft.)
      Lowest elevation =   84.300(Ft.)
      Elevation difference =    0.200(Ft.) Slope =  0.182 %
      Top of Initial Area Slope adjusted by User to  1.000 %
      Bottom of Initial Area Slope adjusted by User to  1.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 65.00 (Ft)
      for the top area slope value of   1.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.93 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  65.000^.5)/(   1.000^(1/3)]=   4.93
      The initial area total distance of  110.00 (Ft.) entered leaves a
      remaining distance of   45.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.86
minutes
      for a distance of  45.00 (Ft.) and a slope of  1.00 %
      with an elevation difference of   0.45(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.862 Minutes
      Tt=[(11.9*0.0085^3)/(  0.45)]^.385=  0.86
      Total initial area Ti =   4.93 minutes from Figure 3-3 formula plus
        0.86 minutes from the Figure 3-4 formula =   5.80 minutes
      Rainfall intensity (I) =      6.228(In/Hr) for a   100.0 year storm
```

```
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      3.786(CFS)
      Total initial stream area =        0.800(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      216.000 to Point/Station
217.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    80.510(Ft.)
      Downstream point/station elevation =    80.200(Ft.)
      Pipe length  =    61.00(Ft.) Slope =   0.0051  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     3.786(CFS)
      Nearest computed pipe diameter  =     15.00(In.)
      Calculated individual pipe flow  =     3.786(CFS)
      Normal flow depth in pipe =   10.36(In.)
      Flow top width inside pipe =   13.87(In.)
      Critical Depth =    9.43(In.)
      Pipe flow velocity =      4.19(Ft/s)
      Travel time through pipe =    0.24 min.
      Time of concentration (TC) =     6.04 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      217.000 to Point/Station
217.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 3
      Stream flow area =      0.800(Ac.)
      Runoff from this stream =      3.786(CFS)
      Time of concentration =    6.04 min.
      Rainfall intensity =     6.065(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1        2.215      6.03             6.072
      2        0.937      2.83             6.850
      3        3.786      6.04             6.065
      Qmax(1) =
               1.000 *    1.000 *     2.215) +
               0.886 *    1.000 *     0.937) +
               1.000 *    0.998 *     3.786) + =       6.825
      Qmax(2) =
               1.000 *    0.470 *     2.215) +
               1.000 *    1.000 *     0.937) +
```

```
          1.000 *    0.469 *     3.786) + =       3.753
     Qmax(3) =
          0.999 *    1.000 *     2.215) +
          0.885 *    1.000 *     0.937) +
          1.000 *    1.000 *     3.786) + =       6.829

     Total of 3 streams to confluence:
     Flow rates before confluence point:
          2.215       0.937       3.786
     Maximum flow rates at confluence using above data:
          6.825       3.753       6.829
     Area of streams before confluence:
          0.450       0.180       0.800
     Results of confluence:
     Total flow rate =      6.829(CFS)
     Time of concentration =     6.039 min.
     Effective stream area after confluence =      1.430(Ac.)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      217.000 to Point/Station
219.000
     **** USER DEFINED FLOW INFORMATION AT A POINT ****
     ____________________________________________________________________
___
     User specified 'C' value of 0.760 given for subarea
     Rainfall intensity (I) =      6.090(In/Hr) for a   100.0 year storm
     User specified values are as follows:
     TC =   6.00 min.  Rain intensity =       6.09(In/Hr)
     Total area =        1.430(Ac.)  Total runoff =     3.720(CFS)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
     Process from Point/Station      217.000 to Point/Station
219.000
     **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
     ____________________________________________________________________
___
     Upstream point/station elevation =    80.200(Ft.)
     Downstream point/station elevation =    70.030(Ft.)
     Pipe length  =   110.00(Ft.) Slope =   0.0925  Manning's N = 0.013
     No. of pipes = 1  Required pipe flow  =     3.720(CFS)
     Nearest computed pipe diameter  =      9.00(In.)
     Calculated individual pipe flow  =     3.720(CFS)
     Normal flow depth in pipe =    5.76(In.)
     Flow top width inside pipe =    8.64(In.)
     Critical depth could not be calculated.
     Pipe flow velocity =     12.46(Ft/s)
     Travel time through pipe =    0.15 min.
     Time of concentration (TC) =     6.15 min.
```

```
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      219.000 to Point/Station
219.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 2
      Stream flow area =      1.430(Ac.)
      Runoff from this stream =      3.720(CFS)
      Time of concentration =    6.15 min.
      Rainfall intensity =     5.996(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       13.856     16.27             3.200
      2        3.720      6.15             5.996
      Qmax(1) =
               1.000 *    1.000 *    13.856) +
               0.534 *    1.000 *     3.720) + =      15.842
      Qmax(2) =
               1.000 *    0.378 *    13.856) +
               1.000 *    1.000 *     3.720) + =       8.955

      Total of 2 main streams to confluence:
      Flow rates before confluence point:
            13.856       3.720
      Maximum flow rates at confluence using above data:
             15.842        8.955
      Area of streams before confluence:
              9.966        1.430


      Results of confluence:
      Total flow rate =     15.842(CFS)
      Time of concentration =    16.272 min.
      Effective stream area after confluence  =     11.396(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      219.000 to Point/Station
220.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    70.030(Ft.)
      Downstream point/station elevation =    69.440(Ft.)
      Pipe length  =   117.00(Ft.) Slope =   0.0050  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    15.842(CFS)
```

```
      Nearest computed pipe diameter  =     24.00(In.)
      Calculated individual pipe flow  =    15.842(CFS)
      Normal flow depth in pipe =   19.36(In.)
      Flow top width inside pipe =   18.96(In.)
      Critical Depth =   17.23(In.)
      Pipe flow velocity =      5.83(Ft/s)
      Travel time through pipe =    0.33 min.
      Time of concentration (TC) =    16.61 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      219.000 to Point/Station
220.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =     11.396(Ac.)
      Runoff from this stream =     15.842(CFS)
      Time of concentration =   16.61 min.
      Rainfall intensity =     3.158(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      218.000 to Point/Station
220.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   33.000(Ft.)
      Highest elevation =   84.760(Ft.)
      Lowest elevation =   71.720(Ft.)
      Elevation difference =   13.040(Ft.) Slope = 39.515 %
      Top of Initial Area Slope adjusted by User to 13.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  13.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Table 3-2
      Initial Area Time of Concentration =   2.70 minutes
       (for slope value of  10.00 %)
      Calculated TC of    2.700 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
```

```
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      1.093(CFS)
      Total initial stream area =        0.210(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      220.000 to Point/Station
220.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =      0.210(Ac.)
      Runoff from this stream =      1.093(CFS)
      Time of concentration =    2.70 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)


      1       15.842     16.61              3.158
      2        1.093      2.70              6.850
      Qmax(1) =
               1.000 *    1.000 *    15.842) +
               0.461 *    1.000 *     1.093) + =      16.346
      Qmax(2) =
               1.000 *    0.163 *    15.842) +
               1.000 *    1.000 *     1.093) + =       3.669

      Total of 2 streams to confluence:
      Flow rates before confluence point:
            15.842       1.093
      Maximum flow rates at confluence using above data:
             16.346        3.669
      Area of streams before confluence:
             11.396        0.210
      Results of confluence:
      Total flow rate =     16.346(CFS)
      Time of concentration =    16.607 min.
      Effective stream area after confluence =     11.606(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      220.000 to Point/Station
226.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    69.440(Ft.)
      Downstream point/station elevation =    69.000(Ft.)
```

```
      Pipe length  =    88.00(Ft.) Slope =   0.0050  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =    16.346(CFS)
      Nearest computed pipe diameter  =     27.00(In.)
      Calculated individual pipe flow  =    16.346(CFS)
      Normal flow depth in pipe =   17.39(In.)
      Flow top width inside pipe =   25.85(In.)
      Critical Depth =   16.94(In.)
      Pipe flow velocity =      6.04(Ft/s)
      Travel time through pipe =    0.24 min.
      Time of concentration (TC) =    16.85 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      220.000 to Point/Station
226.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ____________________________________________________________________
___
      The following data inside Main Stream is listed:
      In Main Stream number: 1
      Stream flow area =     11.606(Ac.)
      Runoff from this stream =     16.346(CFS)
      Time of concentration =   16.85 min.
      Rainfall intensity =     3.129(In/Hr)
      Program is now starting with Main Stream No. 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      221.000 to Point/Station
222.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =  125.000(Ft.)
      Highest elevation =   77.000(Ft.)
      Lowest elevation =   69.540(Ft.)
      Elevation difference =    7.460(Ft.) Slope =  5.968 %
      Top of Initial Area Slope adjusted by User to  5.000 %
      Bottom of Initial Area Slope adjusted by User to  5.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 95.00 (Ft)
      for the top area slope value of   5.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
```

```
      Initial Area Time of Concentration =   3.49 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  95.000^.5)/(   5.000^(1/3)]=   3.49
      The initial area total distance of  125.00 (Ft.) entered leaves a
      remaining distance of   30.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.34
minutes
      for a distance of  30.00 (Ft.) and a slope of  5.00 %
      with an elevation difference of   1.50(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.340 Minutes
      Tt=[(11.9*0.0057^3)/(  1.50)]^.385=  0.34
      Total initial area Ti =   3.49 minutes from Figure 3-3 formula plus
        0.34 minutes from the Figure 3-4 formula =   3.83 minutes
      Calculated TC of    3.828 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      1.458(CFS)
      Total initial stream area =        0.280(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      222.000 to Point/Station
225.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ____________________________________________________________________
___
      Upstream point/station elevation =    69.800(Ft.)
      Downstream point/station elevation =    69.500(Ft.)
      Pipe length  =    50.00(Ft.) Slope =   0.0060  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     1.458(CFS)
      Nearest computed pipe diameter  =     12.00(In.)
      Calculated individual pipe flow  =     1.458(CFS)
      Normal flow depth in pipe =    6.20(In.)
      Flow top width inside pipe =   11.99(In.)
      Critical Depth =    6.14(In.)
      Pipe flow velocity =      3.56(Ft/s)
      Travel time through pipe =    0.23 min.
      Time of concentration (TC) =     4.06 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      222.000 to Point/Station
225.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =      0.280(Ac.)
      Runoff from this stream =      1.458(CFS)
```

```
      Time of concentration =    4.06 min.
      Rainfall intensity =     6.850(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      223.000 to Point/Station
224.000
      **** INITIAL AREA EVALUATION ****
      ------------------------------------------------------------------------
___
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      [HIGH DENSITY RESIDENTIAL                    ]
      (43.0 DU/A or Less      )
      Impervious value, Ai = 0.800
      Sub-Area C Value = 0.760
      Initial subarea total flow distance  =   87.000(Ft.)
      Highest elevation =   86.330(Ft.)
      Lowest elevation =   83.670(Ft.)
      Elevation difference =    2.660(Ft.) Slope =  3.057 %
      Top of Initial Area Slope adjusted by User to  3.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 85.00 (Ft)
      for the top area slope value of   3.00 %, in a development type of
       43.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   3.91 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7600)*(  85.000^.5)/(   3.000^(1/3)]=   3.91
      Calculated TC of    3.912 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
      Subarea runoff =      0.677(CFS)
      Total initial stream area =        0.130(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      224.000 to Point/Station
225.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
___
      Estimated mean flow rate at midpoint of channel =      1.494(CFS)
      Depth of flow =   0.164(Ft.), Average velocity =   5.982(Ft/s)
            ******* Irregular Channel Data ***********
      ---------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.50
```

```
        2              1.00              0.40
        3              2.00              0.30
        4              3.00              0.10
        5              4.00              0.00
        6              5.00              0.10
        7              6.00              0.30
        8              7.00              0.40
      Manning's 'N' friction factor =   0.015
      -----------------------------------------------------------------
      Sub-Channel flow  =      1.494(CFS)
        '     '    flow top width =      2.645(Ft.)
        '     '     velocity=    5.982(Ft/s)
        '     '    area =      0.250(Sq.Ft)
        '     '    Froude number =     3.430

      Upstream point elevation =    83.670(Ft.)
      Downstream point elevation =    71.580(Ft.)
      Flow length =   141.000(Ft.)
      Travel time  =    0.39 min.
      Time of concentration =    4.31 min.
      Depth of flow =   0.164(Ft.)
      Average velocity =   5.982(Ft/s)
      Total irregular channel flow =     1.494(CFS)
      Irregular channel normal depth above invert elev. =   0.164(Ft.)
      Average velocity of channel(s) =   5.982(Ft/s)
       Adding area flow to channel
      Calculated TC of    4.305 minutes is less than 5 minutes,
       resetting TC to 5.0 minutes for rainfall intensity calculations
      Rainfall intensity (I) =      6.850(In/Hr) for a   100.0 year storm
      User specified 'C' value of 0.740 given for subarea
      Rainfall intensity =      6.850(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.746  CA =      0.331
      Subarea runoff =      1.592(CFS) for      0.314(Ac.)
      Total runoff =      2.269(CFS)    Total area =       0.444(Ac.)
      Depth of flow =   0.195(Ft.), Average velocity =   6.763(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      225.000 to Point/Station
225.000
      **** CONFLUENCE OF MINOR STREAMS ****
      ____________________________________________________________________
___
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =      0.444(Ac.)
      Runoff from this stream =      2.269(CFS)
      Time of concentration =    4.31 min.
      Rainfall intensity =     6.850(In/Hr)
      Summary of stream data:

      Stream   Flow rate      TC            Rainfall Intensity
       No.       (CFS)       (min)                 (In/Hr)
```

```
      1        1.458      4.06              6.850
      2        2.269      4.31              6.850
      Qmax(1) =
                1.000 *    1.000 *     1.458) +
                1.000 *    0.944 *     2.269) + =       3.598
      Qmax(2) =
                1.000 *    1.000 *     1.458) +
                1.000 *    1.000 *     2.269) + =       3.726

      Total of 2 streams to confluence:
      Flow rates before confluence point:
             1.458       2.269
      Maximum flow rates at confluence using above data:
              3.598        3.726
      Area of streams before confluence:
              0.280        0.444
      Results of confluence:
      Total flow rate =      3.726(CFS)
      Time of concentration =     4.305 min.
      Effective stream area after confluence =      0.724(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      225.000 to Point/Station
226.000
      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
      ------------------------------------------------------------------------
---
      Upstream point/station elevation =    69.500(Ft.)
      Downstream point/station elevation =    69.000(Ft.)
      Pipe length  =    60.00(Ft.) Slope =   0.0083  Manning's N = 0.013
      No. of pipes = 1  Required pipe flow  =     3.726(CFS)
      Nearest computed pipe diameter  =     15.00(In.)
      Calculated individual pipe flow  =     3.726(CFS)
      Normal flow depth in pipe =    8.65(In.)
      Flow top width inside pipe =   14.82(In.)
      Critical Depth =    9.36(In.)
      Pipe flow velocity =      5.08(Ft/s)
      Travel time through pipe =    0.20 min.
      Time of concentration (TC) =     4.50 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      226.000 to Point/Station
226.000
      **** CONFLUENCE OF MAIN STREAMS ****
      ------------------------------------------------------------------------
---
      The following data inside Main Stream is listed:
      In Main Stream number: 2
```

```
Stream flow area =      0.724(Ac.)
Runoff from this stream =      3.726(CFS)
Time of concentration =    4.50 min.
Rainfall intensity =     6.850(In/Hr)
Summary of stream data:

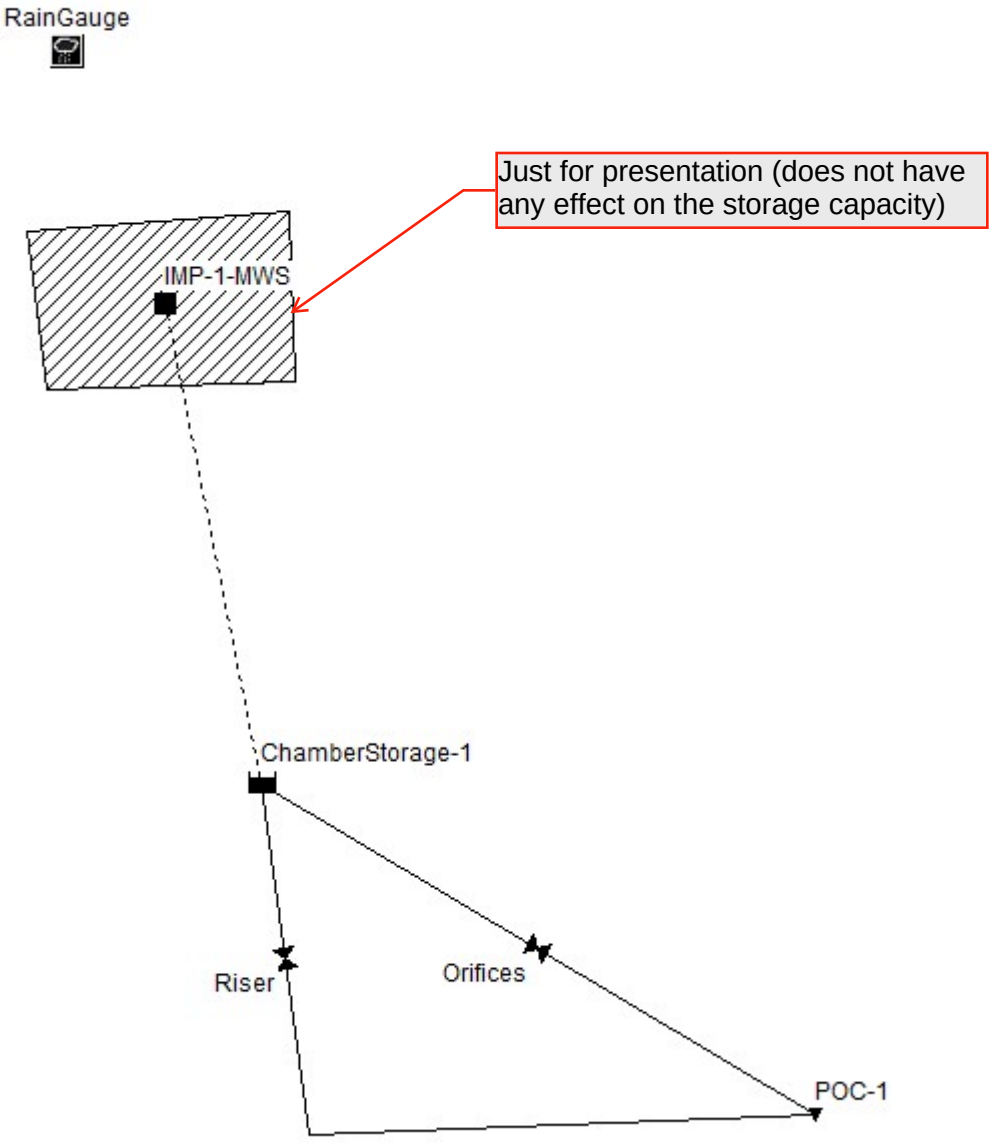
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       16.346     16.85             3.129
2        3.726      4.50             6.850
Qmax(1) =
         1.000 *    1.000 *    16.346) +
         0.457 *    1.000 *     3.726) + =      18.048
Qmax(2) =
         1.000 *    0.267 *    16.346) +
         1.000 *    1.000 *     3.726) + =       8.094

Total of 2 main streams to confluence:
Flow rates before confluence point:
      16.346       3.726
Maximum flow rates at confluence using above data:
       18.048        8.094
Area of streams before confluence:
       11.606        0.724


Results of confluence:
Total flow rate =     18.048(CFS)
Time of concentration =    16.849 min.
Effective stream area after confluence  =     12.330(Ac.)
End of computations, total study area =          12.330 (Ac.)
```

APPENDIX D
ATTENUATION/HYDRAULIC ANALYSIS


RainGauge
Just for presentation (does not have any effect on the storage capacity)
IMP-1-MWS
ChamberStorage-1
Riser
Orifices
POC-1

Subcatchment IMP-1-MWS

Property	Value
Name	IMP-1-MWS
X-Coordinate	234.317
Y-Coordinate	-35.157
Description	
Tag	
Rain Gage	RainGauge
Outlet	ChamberStorage-1
Area	0.001
Width	10
% Slope	0
% Imperv	0
N-Imperv	0.012
N-Perv	0.15
Dstore-Imperv	0.05
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
N-Perv Pattern	
Dstore Pattern	
Infil. Pattern	

Storage Unit ChamberStorage-1

Property	Value
Name	ChamberStorage-1
X-Coordinate	254.858
Y-Coordinate	-137.861
Description	
Tag	
Inflows	YES
Treatment	NO
Invert El.	92
Max. Depth	5.5
Initial Depth	0
Surcharge Depth	0
Evap. Factor	0
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	SurfaceStorage-1

Storage Curve Editor

Curve Name: SurfaceStorage-1

Description: Chamber

	Depth (ft)	Area (ft2)
1	0.00	840.00
2	0.08	840.00
3	0.17	840.00
4	0.25	840.00
5	0.33	840.00
6	0.42	840.00
7	0.50	840.00
8	0.58	840.00
9	0.67	840.00
10	0.75	840.00
11	0.83	1875.17

View... Load... Save... OK Cancel Help

Weir Riser

Property	Value
Name	Riser
Inlet Node	ChamberStorage-1
Outlet Node	POC-1
Description	
Tag	
Type	TRANSVERSE
Height	0.1
Length	8
Side Slope	0
Inlet Offset	0.1
Discharge Coeff.	3.33
Flap Gate	NO
End Contractions	0
End Coeff.	0
Can Surcharge	YES
Coeff. Curve	
Roadway Weir	
Road Width	0
Road Surface	PAVED

INPUT

```
[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           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/02/2000
END_TIME             23:59:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:00:15
WET_STEP             00:00:15
DRY_STEP             00:00:15
ROUTING_STEP         0:00:10
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         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .06    .08    .11    .15    .17    .19    .19    .18    .15    .11
   .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

```
;;-------------- --------- ------ ------ ----------
RainGauge        VOLUME    0:05     1.0      TIMESERIES 6hr-Time

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width
%Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- --------
-------- -------- ----------------
IMP-1-MWS        RainGauge        ChamberStorage-1 0.001    0        10       0
   0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
IMP-1-MWS        0.012      0.15       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
IMP-1-MWS        1.5        0.3        0.33       7          0

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

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
    N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ----------
---------------------------- -------- --------          -------- --------
ChamberStorage-1 92       5.5        0          TABULAR    SurfaceStorage-1
    0        0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff
  Gated    EndCon   EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ----------
---------- -------- -------- ---------- ---------- ---------- ----------
----------------
Riser            ChamberStorage-1 POC-1            TRANSVERSE   0.1        3.33
  NO       0        0          YES

[OUTLETS]
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ---------------
---------------- ---------- --------
```

```
Orifices         ChamberStorage-1 POC-1            0          TABULAR/HEAD
RatingCurve                 NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ----------
---------- ----------
Riser            RECT_OPEN    0.1              8          0          0

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor
Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- --------
-------- --------
ChamberStorage-1 FLOW             6hr-100Time      FLOW     1.0      1.0


[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Orifices
RatingCurve      Rating     0          0
RatingCurve                 0.0833     0.0016
RatingCurve                 0.1667     0.0025
RatingCurve                 0.2500     0.0031
RatingCurve                 0.3333     0.0037
RatingCurve                 0.4167     0.0041
RatingCurve                 0.5000     0.0045
RatingCurve                 0.5833     0.0049
RatingCurve                 0.6667     0.0053
RatingCurve                 0.7500     0.0056
RatingCurve                 0.8333     0.0059
RatingCurve                 0.9167     0.0062
RatingCurve                 1.0000     0.0065
RatingCurve                 1.0833     0.0068
RatingCurve                 1.1667     0.0070
RatingCurve                 1.2500     0.0073
RatingCurve                 1.3333     0.0075
RatingCurve                 1.4167     0.0078
RatingCurve                 1.5000     0.0080
RatingCurve                 1.5833     0.0082
RatingCurve                 1.6667     0.0084
RatingCurve                 1.7500     0.0086
RatingCurve                 1.8333     0.0088
RatingCurve                 1.9167     0.0090
RatingCurve                 2.0000     0.0092
RatingCurve                 2.0833     0.0094
RatingCurve                 2.1667     0.0096
RatingCurve                 2.2500     0.0098
```

```
RatingCurve                 2.3333     0.0100
RatingCurve                 2.4167     0.0102
RatingCurve                 2.5000     0.0103
RatingCurve                 2.5833     0.0105
RatingCurve                 2.6667     0.0107
RatingCurve                 2.7500     0.0108
RatingCurve                 2.8333     0.0110
RatingCurve                 2.9167     0.0112
RatingCurve                 3.0000     0.0113
RatingCurve                 3.0833     0.3518
RatingCurve                 3.1667     0.5315
RatingCurve                 3.2500     0.6635
RatingCurve                 3.3333     0.7730
RatingCurve                 3.4167     0.8686
RatingCurve                 3.5000     0.9546
RatingCurve                 3.5833     1.0334
RatingCurve                 3.6667     1.1066
RatingCurve                 3.7500     1.1752
RatingCurve                 3.8333     1.2400
RatingCurve                 3.9167     1.3015
RatingCurve                 4.0000     1.3602
RatingCurve                 4.0833     1.3803
RatingCurve                 4.1667     1.4292
RatingCurve                 4.2500     1.4766
RatingCurve                 4.3333     1.5224
RatingCurve                 4.4167     1.5669
RatingCurve                 4.5000     1.6101
RatingCurve                 4.5833     1.6523
RatingCurve                 4.6667     1.6933
RatingCurve                 4.7500     1.7334
RatingCurve                 4.8333     1.7726
RatingCurve                 4.9167     1.8110
RatingCurve                 5.0000     1.8485
RatingCurve                 5.0833     1.8853
RatingCurve                 5.1667     1.9214
RatingCurve                 5.2500     1.9568
RatingCurve                 5.3333     1.9916
RatingCurve                 5.4167     2.0257
RatingCurve                 5.5000     2.0594
;
;Chamber
SurfaceStorage-1 Storage    0.00       840.00
SurfaceStorage-1            0.08       840.00
SurfaceStorage-1            0.17       840.00
SurfaceStorage-1            0.25       840.00
SurfaceStorage-1            0.33       840.00
SurfaceStorage-1            0.42       840.00
SurfaceStorage-1            0.50       840.00
SurfaceStorage-1            0.58       840.00
SurfaceStorage-1            0.67       840.00
```

SurfaceStorage-1	0.75	840.00
SurfaceStorage-1	0.83	1875.17
SurfaceStorage-1	0.92	1865.85
SurfaceStorage-1	1.00	1859.55
SurfaceStorage-1	1.08	1853.33
SurfaceStorage-1	1.17	1846.57
SurfaceStorage-1	1.25	1839.92
SurfaceStorage-1	1.33	1832.72
SurfaceStorage-1	1.42	1825.33
SurfaceStorage-1	1.50	1817.45
SurfaceStorage-1	1.58	1809.11
SurfaceStorage-1	1.67	1800.42
SurfaceStorage-1	1.75	1791.30
SurfaceStorage-1	1.83	1781.77
SurfaceStorage-1	1.92	1771.62
SurfaceStorage-1	2.00	1761.08
SurfaceStorage-1	2.08	1750.18
SurfaceStorage-1	2.17	1737.90
SurfaceStorage-1	2.25	1725.67
SurfaceStorage-1	2.33	1712.94
SurfaceStorage-1	2.42	1699.26
SurfaceStorage-1	2.50	1684.73
SurfaceStorage-1	2.58	1669.58
SurfaceStorage-1	2.67	1653.68
SurfaceStorage-1	2.75	1636.94
SurfaceStorage-1	2.83	1619.39
SurfaceStorage-1	2.92	1600.87
SurfaceStorage-1	3.00	1581.41
SurfaceStorage-1	3.08	1560.92
SurfaceStorage-1	3.17	1538.91
SurfaceStorage-1	3.25	1515.83
SurfaceStorage-1	3.33	1491.40
SurfaceStorage-1	3.42	1464.94
SurfaceStorage-1	3.50	1437.19
SurfaceStorage-1	3.58	1406.74
SurfaceStorage-1	3.67	1374.46
SurfaceStorage-1	3.75	1338.69
SurfaceStorage-1	3.83	1299.30
SurfaceStorage-1	3.92	1255.06
SurfaceStorage-1	4.00	1204.49
SurfaceStorage-1	4.08	1139.96
SurfaceStorage-1	4.17	1040.83
SurfaceStorage-1	4.25	958.48
SurfaceStorage-1	4.33	926.28
SurfaceStorage-1	4.42	896.93
SurfaceStorage-1	4.50	856.73
SurfaceStorage-1	4.58	840.00
SurfaceStorage-1	4.67	840.00
SurfaceStorage-1	4.75	840.00
SurfaceStorage-1	4.83	840.00

```
SurfaceStorage-1            4.92       840.00
SurfaceStorage-1            5.00       840.00
SurfaceStorage-1            5.08       840.00
SurfaceStorage-1            5.17       840.00
SurfaceStorage-1            5.25       840.00
SurfaceStorage-1            5.33       840.00
SurfaceStorage-1            5.42       840.00
SurfaceStorage-1            5.50       840.00

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
6hr-Time                    0:00       0.00
6hr-Time                    0:06       0.17
6hr-Time                    0:12       0.17
6hr-Time                    0:18       0.17
6hr-Time                    0:24       0.18
6hr-Time                    0:30       0.18
6hr-Time                    0:36       0.18
6hr-Time                    0:42       0.19
6hr-Time                    0:48       0.19
6hr-Time                    0:54       0.19
6hr-Time                    1:00       0.20
6hr-Time                    1:06       0.20
6hr-Time                    1:12       0.21
6hr-Time                    1:18       0.21
6hr-Time                    1:24       0.22
6hr-Time                    1:30       0.22
6hr-Time                    1:36       0.23
6hr-Time                    1:42       0.24
6hr-Time                    1:48       0.24
6hr-Time                    1:54       0.25
6hr-Time                    2:00       0.25
6hr-Time                    2:06       0.26
6hr-Time                    2:12       0.27
6hr-Time                    2:18       0.28
6hr-Time                    2:24       0.29
6hr-Time                    2:30       0.31
6hr-Time                    2:36       0.32
6hr-Time                    2:42       0.33
6hr-Time                    2:48       0.35
6hr-Time                    2:54       0.37
6hr-Time                    3:00       0.39
6hr-Time                    3:06       0.42
6hr-Time                    3:12       0.44
6hr-Time                    3:18       0.49
6hr-Time                    3:24       0.52
6hr-Time                    3:30       0.59
6hr-Time                    3:36       0.64
6hr-Time                    3:42       0.78
```

```
6hr-Time                    3:48       0.89
6hr-Time                    3:54       1.31
6hr-Time                    4:00       1.85
6hr-Time                    4:06       6.83
6hr-Time                    4:12       1.05
6hr-Time                    4:18       0.70
6hr-Time                    4:24       0.55
6hr-Time                    4:30       0.46
6hr-Time                    4:36       0.40
6hr-Time                    4:42       0.36
6hr-Time                    4:48       0.32
6hr-Time                    4:54       0.30
6hr-Time                    5:00       0.28
6hr-Time                    5:06       0.26
6hr-Time                    5:12       0.24
6hr-Time                    5:18       0.23
6hr-Time                    5:24       0.22
6hr-Time                    5:30       0.21
6hr-Time                    5:36       0.20
6hr-Time                    5:42       0.19
6hr-Time                    5:48       0.18
6hr-Time                    5:54       0.18
6hr-Time                    6:00       0.17
;
6hr-100Time                 0:00       0.00
6hr-100Time                 0:06       0.17
6hr-100Time                 0:12       0.17
6hr-100Time                 0:18       0.17
6hr-100Time                 0:24       0.18
6hr-100Time                 0:30       0.18
6hr-100Time                 0:36       0.18
6hr-100Time                 0:42       0.19
6hr-100Time                 0:48       0.19
6hr-100Time                 0:54       0.19
6hr-100Time                 1:00       0.20
6hr-100Time                 1:06       0.20
6hr-100Time                 1:12       0.21
6hr-100Time                 1:18       0.21
6hr-100Time                 1:24       0.22
6hr-100Time                 1:30       0.22
6hr-100Time                 1:36       0.23
6hr-100Time                 1:42       0.24
6hr-100Time                 1:48       0.24
6hr-100Time                 1:54       0.25
6hr-100Time                 2:00       0.25
6hr-100Time                 2:06       0.26
6hr-100Time                 2:12       0.27
6hr-100Time                 2:18       0.28
6hr-100Time                 2:24       0.29
6hr-100Time                 2:30       0.31
```

```
6hr-100Time                2:36       0.32
6hr-100Time                2:42       0.33
6hr-100Time                2:48       0.35
6hr-100Time                2:54       0.37
6hr-100Time                3:00       0.39
6hr-100Time                3:06       0.42
6hr-100Time                3:12       0.44
6hr-100Time                3:18       0.49
6hr-100Time                3:24       0.52
6hr-100Time                3:30       0.59
6hr-100Time                3:36       0.64
6hr-100Time                3:42       0.78
6hr-100Time                3:48       0.89
6hr-100Time                3:54       1.31
6hr-100Time                4:00       1.85
6hr-100Time                4:06       6.83
6hr-100Time                4:12       1.05
6hr-100Time                4:18       0.70
6hr-100Time                4:24       0.55
6hr-100Time                4:30       0.46
6hr-100Time                4:36       0.40
6hr-100Time                4:42       0.36
6hr-100Time                4:48       0.32
6hr-100Time                4:54       0.30
6hr-100Time                5:00       0.28
6hr-100Time                5:06       0.26
6hr-100Time                5:12       0.24
6hr-100Time                5:18       0.23
6hr-100Time                5:24       0.22
6hr-100Time                5:30       0.21
6hr-100Time                5:36       0.20
6hr-100Time                5:42       0.19
6hr-100Time                5:48       0.18
6hr-100Time                5:54       0.18
6hr-100Time                6:00       0.17

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

[TAGS]

[MAP]
DIMENSIONS -129.191 -319.762 933.945 189.693
Units      Feet

[COORDINATES]
```

```
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            373.122            -208.197
ChamberStorage-1 254.858            -137.861

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Riser            265.178            -212.385

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
IMP-1-MWS        260.988            -15.424
IMP-1-MWS        262.222            -51.807
IMP-1-MWS        209.188            -53.657
IMP-1-MWS        204.871            -19.740

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
RainGauge        208.576            70.011
```

OUTPUT

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
  ---------------------------------------------------------------

  WARNING 09: time series interval greater than recording interval for Rain Gage
RainGauge

  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 1
  Number of nodes ........... 2
  Number of links ........... 2
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                    Data       Recording
  Name                 Data Source                  Type       Interval
  ------------------------------------------------------------------------
  RainGauge            6hr-Time                     VOLUME       5 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv    %Slope Rain Gage
 Outlet

-------------------------------------------------------------------------------
------------------------
  IMP-1-MWS                   0.00     10.00      0.00    0.0000 RainGauge
 ChamberStorage-1


  ************
  Node Summary
  ************
                                          Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow
  ------------------------------------------------------------------------------
  POC-1                OUTFALL              0.00      0.00       0.0
  ChamberStorage-1     STORAGE             92.00      5.50       0.0    Yes


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

```
  Link Summary
  ************
  Name              From Node         To Node           Type             Length
%Slope Roughness

-------------------------------------------------------------------------------
----------
  Riser             ChamberStorage-1 POC-1             WEIR
  Orifices          ChamberStorage-1 POC-1             OUTLET


  *********************
  Cross Section Summary
  *********************
                                          Full      Full      Hyd.      Max.    No. of
 Full
  Conduit           Shape                 Depth     Area      Rad.     Width   Barrels
 Flow

-------------------------------------------------------------------------------
----


  ***********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ***********************************************************

  ****************
  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 ............ 01/01/2000 00:00:00
  Ending Date .............. 01/02/2000 23:59:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:00:15
  Wet Time Step ............ 00:00:15
  Dry Time Step ............ 00:00:15
```

Routing Time Step .... 10.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	0.002	28.520
Evaporation Loss	0.000	0.120
Infiltration Loss	0.002	22.798
Surface Runoff	0.000	0.000
Final Storage	0.000	5.602
Continuity Error (%)	0.000	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.235	0.077
External Outflow	0.235	0.077
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 (%)	-0.015	

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

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

Minimum Time Step	:	9.00 sec
Average Time Step	:	10.00 sec
Maximum Time Step	:	10.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent 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 10^6 gal	Total Peak Runoff CFS	Runoff Coeff
IMP-1-MWS	28.52	0.00	0.12	22.80	0.00	0.00	0.00	0.00	0.000

  ****
  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
ChamberStorage-1	STORAGE	0.05	1.12	93.12	0 04:09	1.12

  ****
  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	0.00	3.72	0 04:09	0		

0.0766 0.000
ChamberStorage-1 STORAGE 6.83 6.83 0 04:06 0.0766
0.0766 -0.015

****
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
ChamberStorage-1	0.041	1	0	0	1.281	18	0 04:09	3.72

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	29.80	0.20	3.72	0.077
System	29.80	0.20	3.72	0.077

****
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
Riser	WEIR	3.71	0	04:09			0.00
Orifices	DUMMY	0.01	0	04:09			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 8 12:10:01 2025
Analysis ended on: Mon Sep 8 12:10:01 2025
Total elapsed time: < 1 sec

APPENDIX E
HYDRAULIC CALCULATIONS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, Aug 24 2025

Bypass Pipe

Circular

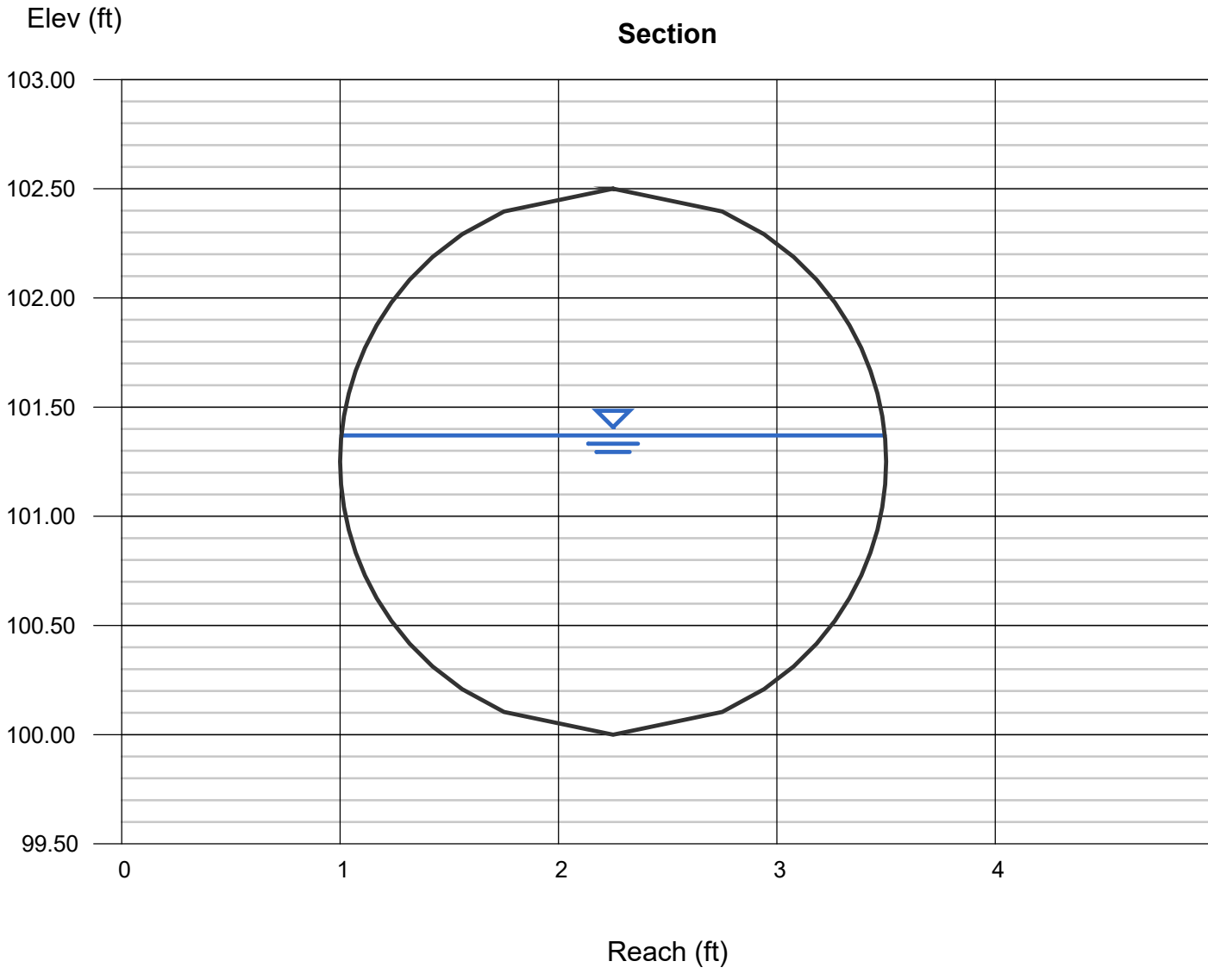
Diameter (ft)	= 2.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.13

Highlighted

Depth (ft)	= 1.37
Q (cfs)	= 18.13
Area (sqft)	= 2.76
Velocity (ft/s)	= 6.56
Wetted Perim (ft)	= 4.17
Crit Depth, Yc (ft)	= 1.45
Top Width (ft)	= 2.49
EGL (ft)	= 2.04



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, Aug 24 2025

Brow-Ditch

Circular

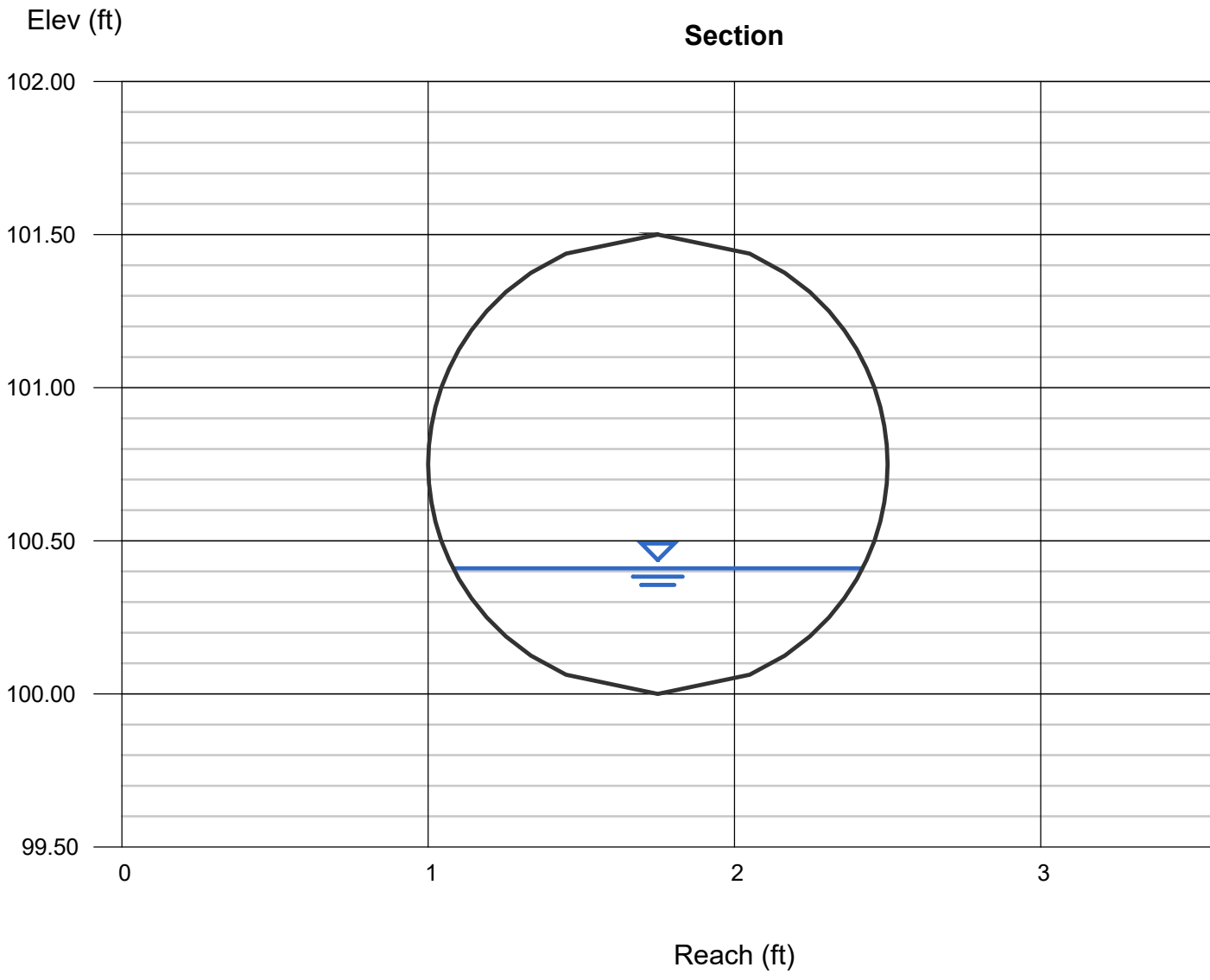
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 3.00
N-Value	= 0.015

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.50

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 2.500
Area (sqft)	= 0.40
Velocity (ft/s)	= 6.32
Wetted Perim (ft)	= 1.66
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 1.34
EGL (ft)	= 1.03



Inlet Report

Street Curb Inlet to MWS

Curb Inlet

Location	=	On grade
Curb Length (ft)	=	9.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	-0-
Grate Width (ft)	=	-0-
Grate Length (ft)	=	-0-

Gutter

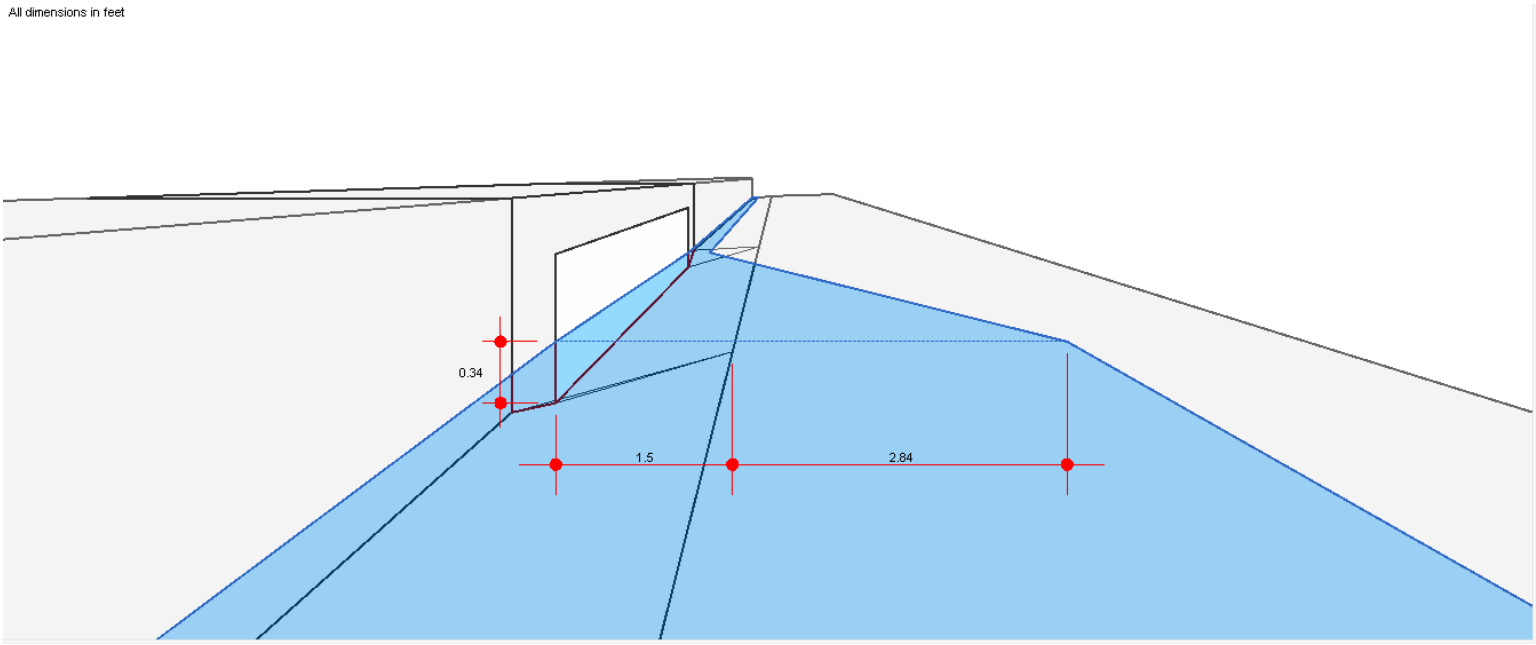
Slope, Sw (ft/ft)	=	0.080
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	2.00
Gutter Width (ft)	=	1.50
Gutter Slope (%)	=	5.20
Gutter n-value	=	0.015

Calculations

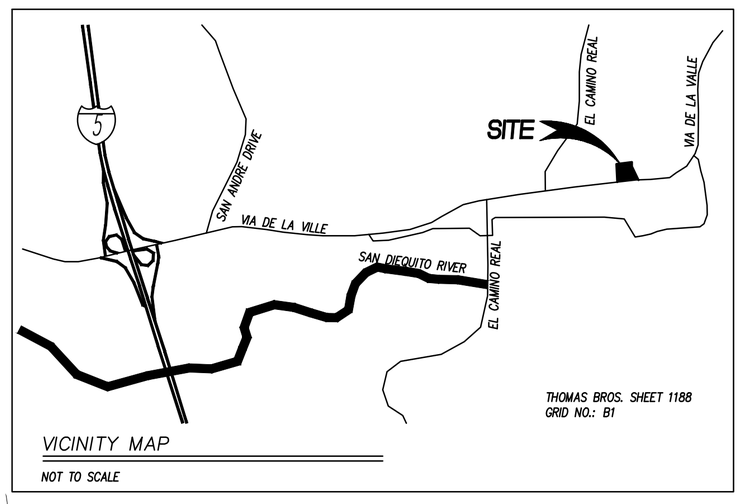
Compute by:		Known Q
Q (cfs)	=	1.20

Highlighted

Q Total (cfs)	=	1.20
Q Capt (cfs)	=	1.18
Q Bypass (cfs)	=	0.02
Depth at Inlet (in)	=	4.12
Efficiency (%)	=	99
Gutter Spread (ft)	=	4.34
Gutter Vel (ft/s)	=	4.69
Bypass Spread (ft)	=	0.45
Bypass Depth (in)	=	0.44



EXHIBITS



VICINITY MAP

NOT TO SCALE

SWS

N

40 20 0 40 80 120

SCALE IN FEET
GRAPHIC SCALE

HATCH

LANDSCAPE AREA

BRICK

BRICK

CONCRETE

WOOD DECK

AP

ROOF

CONTAINER

OFFSITE-BASIN-100.1
A = 8.63 AC

OFFSITE-BASIN-100.2
A = 0.98 AC

THIS BASIN WILL ULTIMATELY DISCHARGE TO OFFSITE (POC–1) VIA ONSITE EAST PARKING LOT, SOUTH VEGETATED CHANNEL AND WEST DRIVEWAY

BASIN-200
A=2.72 ac
Q=12.1 cfs

CONFLUENCE POINT OF MAJORE OFFSITE FLOW WITH ONSITE FLOW

POC–1

100+200
Q_{100}= 18.2
Tc = 20.3
A = 12.33

V_{100}=5.0 F/S

VIA DE LA VALLE

LEGEND

PROPERTY BOUNDARY (2.77 AC)

MAJOR BASIN BOUNDARY

SUBBASIN BOUNDARY

FLOW PATH

SOIL TYPE "D"

GROUNDWATER TABLE > 50'

100
Q_{100}= XXX
Tc = N/A
A = N/A

100–YEAR FREQUENCY DISCHARGE (CFS)
TIME OF CONCENTRATION (MIN)
AREA (AC)

NODE (100)

TABULAR SUMMARY

BASIN #	AREA (AC)	PERVIOUS AREA (AC)	IMPERVIOUS AREA (AC)	WEIGHTED "C"	% IMP	HSG
200	2.72	1.21	1.51	0.66	56	D

PRE DRAINAGE MAP

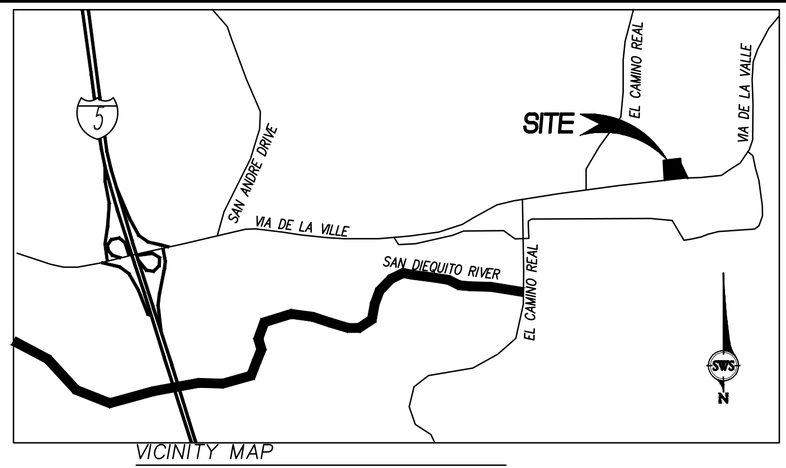
FOR

CHABAD RANCHO SANTA FE

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

DATE:9/9/2025 2:15:56 PM BY:MASSY,FATIN
FILE:Z:\Projects\2021\21-257\PROD\Reports\Hydrology
FILE NAME:21-257_Pre Drainage.dwg

24" x 36"



VICINITY MAP

NO SCALE

SWS
N

40 20 0 40 80 120

SCALE IN FEET
GRAPHIC SCALE

OFFSITE-BASIN-100.1
A = 8.63 AC

OFFSITE-BASIN-100.2
A = 0.98 AC

THIS BASIN WILL ULTIMATELY DISCHARGE TO OFFSITE (POC-1) VIA BROW-DITCH, BYPASS PIPE

OFFSITE DISCHARGE POINT

POC-1

100+200
Q_{100}= 19.7
Tc = 16.8
A = 12.3

ATTENUATED
Q=18.0 CFS
V = 5.1 F/S

Q_{100} (INTO STORAGE) = 6.83 CFS
Q_{100} (OUT OF STORAGE = 4.82 CFS
TO BYPASS PIPE)

VIA DE LA VALLE

LEGEND

NODE	(100)
100-YEAR FREQUENCY DISCHARGE (CFS)	100 / Q_{100} = XXX
TIME OF CONCENTRATION (MIN)	Tc = N/A
AREA (AC)	A = N/A
OFFSITE MAJOR BASIN BOUNDARY	
ONSITE MAJOR BASIN BOUNDARY	
SUBBASIN BOUNDARY	
FLOW PATH	
PROPOSED STORM DRAIN	SD
SOIL TYPE	"D"
GROUNDWATER TABLE	> 50'
BOUNDARY TO REMAIN UNDISTURBED	
PROPOSED MULCH	
PROPOSED ROCK	
PROPOSED GRAVEL	
PROPOSED LANDSCAPE	
PROPOSED PERMEABLE PAVER	
PROPOSED LIME STONE	
PROPOSED CONCRETE PAVING	
PROPOSED CONCRETE	
PROPOSED BLDG	
PROPOSED ASH	
EXISTING BRICK	
EXISTING BRICK	
EXITING CONCRETE	
EXITING CONCRETE WOOD DECK	
EXITING ROOF	
EXISTING AP	
EXISTING LANDSCAPE	

TABULAR SUMMARY

BASIN #	AREA (AC)	PERVIOUS AREA (AC)	IMPERVIOUS AREA (AC)	WEIGHTED "C"	% IMP	HSG
200	2.72	0.81	1.91	0.74	0.70	D

POST DRAINAGE MAP

FOR

CHABAD RANCHO SANTA FE

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

DATE:9/9/2025 9:56:06 AM BY:MASSY,FATINI
FILE:Z:\Projects\2021\21-257\PROD\Reports\Hydrology
FILE NAME:21-257_Post Drainage.dwg

24" x 36"

6.0 General Requirements

- Use this attachment to document all proposed (1) self-mitigating, (2) de minimis, and (3) self-retaining DMAs. Indicate under "DMA Compliance Option" below which design options will be used to satisfy structural performance requirements for one or more DMA.

DMA Compliance Option	Required Sub-attachments or Printouts	BMPDM Design Resources
☒ **Self-mitigating**	• Sub-attachment 6.1	• BMPDM Section 5.2.1
☒ **De minimis**	• Sub-attachment 6.2	• BMPDM Section 5.2.2
☐ **Self-retaining**[1]	• Sub-attachment 6.3	• BMPDM Section 5.2.3 (all options)
SSD-BMP Type(s)		
☐ **Impervious Area Dispersion**	• DCV calculations from SSD-BMP tool • Dispersion Areas calculations from SSD-BMP tool	• Fact Sheet SD-B (Appendix E.8) • Appendix I
☐ **Tree Wells**	• DCV calculations from SSD-BMP tool • Tree Well calculations from SSD-BMP tool	• Fact Sheet SD-A (Appendix E.7) • Appendix I

- Submit this cover page and all "Required Sub-attachments or Printouts" listed for each selected DMA compliance option.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" for additional explanation of design requirements. Each constructed feature must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.

[1] If "Self-retaining" is selected, also choose the types of Significant Site Design BMPs (SSD-BMPs) to be used. SSD-BMPs are Site Design BMPs that are sized and constructed to fully satisfy all applicable Structural Performance Standards for a DMA.

6.1 Self-mitigating DMAs (complete this page once for ALL self-mitigating DMAs)

Self-mitigating DMAs consist of natural or landscaped areas that drain directly offsite or to the public storm drain system. These DMAs are excluded from DCV calculations.

- Provide the information requested below for each proposed self-mitigating DMA. Add rows or copy the table if additional entries are needed.

DMA #	*a. DMA Area (ft^2)*	*Incidental Impervious Area*		*Permit # and Sheet #*
		b. Size(ft^2)	*c. % (b/a*100)*	
3	6,806			
4	9,616			
5	4,724			

- "DMA #", "DMA Area", and "Permit # and Sheet #" are required for all DMAs listed.
- "Incidental Impervious Area" calculations are required only where applicable (see below).
- Each self-mitigating DMA must <u>fully</u> satisfy all design requirements and restrictions described in BMPDM Section 5.2.1 and any other guidance or instruction identified by the County. Check the boxes below to confirm that all required conditions are satisfied <u>for every DMA listed</u>.

☒ Each DMA is hydraulically separate from other DMAs that contain permanent storm water pollutant control BMPs.

<u>Natural and Landscaped Areas</u>

☒ Each DMA consists solely of natural or landscaped areas, except for incidental impervious areas (see below).

☒ Each area drains directly offsite or to the public storm drain system.

☐ Soils are undisturbed native topsoil, or disturbed soils that have been amended and aerated to promote water retention characteristics equivalent to undisturbed native topsoil.

☒ Vegetation is native and/or non-native/non-invasive drought tolerant species that do not require regular application of fertilizers and pesticides.

<u>Incidental Impervious Areas (if applicable; see above)</u>

Minor impervious areas may be permitted within the DMA if they satisfy the following criteria:

☐ They are not hydraulically connected to other impervious areas (unless it is a storm water conveyance system such as a brow ditch).

☐ They comprise less than 5% of the total DMA. Calculate the % incidental impervious area in the table above (c= b/a). DMAs are <u>not</u> self-mitigating if this area is 5% or greater.

6.2 De Minimis DMAs (complete this page once for ALL de minimis DMAs)

De minimis DMAs consist of areas too small to be considered significant contributors of pollutants and not practicable to drain to a BMP. They are excluded from DCV calculations. Examples include driveway aprons connecting to existing streets, portions of sidewalks, retaining walls, and similar features at the external boundaries of a project.

- Provide the information requested below for each proposed de minimis DMA. Add rows or copy the table if additional entries are needed.

DMA #	***DMA Area (ft^2)***	***Permit # and Sheet #***
6	169	

- "DMA #", "DMA Area", and "Permit # and Sheet #" are required.
- Check the boxes below to confirm that each required condition is satisfied for ALL de minimis DMAs on the site.

  ☒ Each DMA listed is less than 250 square feet and not adjacent or hydraulically connected to each other.

  ☒ Each DMA listed <u>fully</u> satisfies all design requirements and restrictions described in BMPDM Section 5.2.2 De Minimis DMAs.

6.3 Self-retaining DMAs using Significant Site Design BMPs

Self-retaining DMAs use Site Design BMPs to fully-retain the entire DCV, at a minimum. Site Design BMPs that fully retain the DCV, at a minimum, therefore replacing the need for a Structural BMP (S-BMP), are classified as Significant Site Design BMPs (SSD-BMPs). To satisfy pollutant control requirements only, self-retaining means retention of the entire DCV. However, under some circumstances, a self-retaining DMA can also satisfy hydromodification management requirements by implementing BMPs that retain a greater volume of runoff.

- Provide the information requested below for each proposed self-retaining DMA. Add rows or copy the table if additional entries are needed.

DMA #	**DMA Area (ft^2)**	**BMP Type** (choose one per DMA)		***Permit # and Sheet #***
		Dispersion Area (Att. 6.3.1)	**Tree Wells (Att. 6.3.2)**	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Copy and Paste table here for additional DMAs

- "DMA #", "DMA Area", and "Permit # and Sheet #" are required.
- Select one BMP Type per DMA. Provide detailed documentation for each DMA in Attachments 6.3.1 (Impervious Dispersion Areas) and/or 6.3.2 (Tree Wells) below.
- Each self-retaining DMA must <u>fully</u> satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, applicable BMPDM Appendix E Fact Sheets, BMPDM Appendix I, and any other guidance or instruction identified by the County.

6.3.1 Self-retaining DMAs with Impervious Dispersion Areas

Impervious area dispersion (dispersion) refers to the practice of effectively disconnecting impervious areas from directly draining to the storm drain system by routing runoff from impervious areas such as rooftops (through downspout disconnection), walkways, and driveways onto the surface of adjacent pervious areas. The intent is to slow runoff discharges and reduce volumes. Dispersion with partial or full infiltration results in significant volume reduction by means of infiltration and evapotranspiration. When adequately sized, dispersion can also be used to satisfy both the pollutant control and hydromodification management structural performance standards for a DMA.

- Each self-retaining DMA with impervious area dispersion must fully satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, Fact Sheet SD-B: Impervious Area Dispersion, and any other guidance or instruction identified by the County.
- Documentation of compliance with all applicable conditions must be submitted with this sub-attachment using the ***Summary Sheet for DMAs with Impervious Area Dispersion*** on the next page. One version of this Summary Sheet must be completed for each applicable DMA.
- Applicants are responsible to comply with all other applicable requirements, regardless of whether they are included in the summary sheet.
- The following applies if the dispersion area is **native soil** (SD-B in Appendix E):
    - For pollutant control only, the DMA is considered self-retaining if the impervious to pervious ratio is:
        - 2:1 when the pervious area is composed of Hydrologic Soil Group A
        - 1:1 when the pervious area is composed of Hydrologic Soil Group B
- The following applies if the dispersion area includes **amended soil** (SD-B in Appendix E):
    - DMAs using impervious area dispersion can be considered to meet both pollutant control and hydromodification flow control requirements if the impervious to pervious area ratio is 1:1 or less and all other design requirements of SD-B are satisfied, including 11 inches of amended soil.

Summary Sheet for Self-retaining DMAs with Impervious Area Dispersion

Attach Printouts from SSD-BMP tool below

- DCV calculations from SSD-BMP tool
- Dispersion Areas calculations from SSD-BMP tool

6.3.2 Self-retaining DMAs with Tree Wells

Trees wells can provide a variety of benefits such as interception and increased infiltration of rainfall, reduced erosion, energy conservation, air quality improvement, and aesthetic enhancement. They can also be used to satisfy both pollutant control and hydromodification management performance standards for a DMA.

- Each self-retaining DMA with tree wells must fully satisfy all design requirements and restrictions described in BMPDM Section 5.2.3, Fact Sheet SD-A: Tree Wells, and any other guidance or instruction identified by the County.
- For pollutant control only, the DMA must retain the entire DCV. For hydromodification management, an additional volume must be retained in accordance with the sizing requirements presented in the DCV multiplier table in Fact Sheet SD-A.
- Documentation of compliance with applicable conditions must be submitted using the ***Summary Sheet for Self-retaining DMAs with Tree Wells*** on the next page. One version of this Summary Sheet must be completed for each applicable DMA.
- If both pollutant control and hydromodification standards apply, the soil depth of all tree wells in the DMA must be selected before determining the Required Retention Volume (RRV). Each tree well must be constructed to the selected depth. For pollutant control only, tree wells within a DMA may be constructed to different soil depths.
- In most cases tree wells must use Amended Soil per Fact Sheet SD-F. However, Structural Soil is required in some cases (e.g., placing the tree well next to a curb). See ***Structural Requirements for Confined Tree Well Soil Volume*** in Fact Sheet SD-A for additional explanation. If applicable, list the DMAs and Tree Well #s below for all tree wells requiring Structural Soil.

DMA #	**Tree Wells Requiring Structural Soil (list Tree Well #s)**

- The Design Capture Volume (DCV) must be known for each DMA in order to determine the volume to be mitigated by the tree wells. Instructions for DCV calculation are provided in BMPDM Appendix I.1. An automated version of Worksheet I.1 (Calculation of Design Capture Volume) is available at www.sandiegocounty.gov/stormwater under the Development Resources tab.

Summary Sheet for Self-retaining DMAs with Tree Wells

Attach Printouts from SSD-BMP tool below

- DCV calculations from SSD-BMP tool
- Tree Wells calculations from SSD-BMP tool

7.0 General Requirements

- Submit this cover page and all required Sub-attachments for all structural BMPs proposed for the project.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" in the table below for additional explanation of design requirements. Constructed features must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management. Completion of SWQMP Attachment 8 is also required for these BMPs.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.
- Structural BMP Certification. All structural BMPs documented this attachment and in Attachment 8 must be certified by a registered engineer in Sub-attachment 7.1.
- Structural BMP Verification. Structural BMP installation must be verified by the County at the completion of construction. Applicants must complete an Installation Verification Form (Attachment 10).

Sub-attachments (check all that are completed)	**Requirement**	**BMPDM Design Resources**
☒ **7.1: Preparer's Certification**	Required	• N/A
☒ **7.2: Structural BMP Strategy**	Required	• BMPDM Sections 5.1., 5.3, 5.4, and Chapter 6 • BMPDM Appendix E (pages E-78 through E-210)
☒ **7.3: Structural BMP Checklist(s)**	Required	
☒ **7.4: Stormwater Pollutant Control Worksheet Calculations**	Required	• BMPDM Appendix B
☒ **7.5: Identification and Narrative of Receiving Water and Pollutants of Concern**	Required if flow-thru BMPs are proposed	• N/A

7.1 Engineer of Work Certification for Structural BMPs

Project Name Chabad RSF
Permit Application Number PDS2023-MUP-23-013

CERTIFICATION

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

I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by County staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of structural storm water BMPs for this project, of my responsibilities for their design.

☒ In addition to the structural pollutant control BMPs described in this attachment, this certification applies to the Structural Hydromodification Management BMPs described in Attachment 8 (check if applicable).

RCE# 59658, Exp. 12/31/27
Engineer of Work's Signature, PE Number & Expiration Date

Michael D. Schweitzer
Print Name

SWS Engineering Inc.
Company

9/9/2025
Date

Engineer's Seal:



7.2 Structural BMP Strategy

7.2.1 Narrative Strategy (Continue description on subsequent pages as necessary)

Describe the general strategy for structural BMP implementation at the project site. For pollutant control BMPs, your description must address the key points outlined in Section 5.1 of the BMP Design Manual, and the type of BMPs selected. For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

Two Modula Wetland Systems (MWS: BF-3, IMP-1.1 and IMP-2) will be constructed on the southeast and east portion of the site for the onsite (DMA-1 and DMA-2) pollutant control treatment BMP and underground storage system (Chamber System (CM-3500, IMP-1.2 within DMA-1 for the hydromodification control requirement.

There is a small area (DMA 1.2) that cannot be captured by the proposed two treatment systems (MWS) since it drains away from them into the bypass storm drain system that convey the site undisturbed area and treated runoff (DMAs 1 & 3-6) including offsite runoff into offsite discharge point (POC-1). In contrast with DMA 1.2, the DMA-1.1 (west offsite driveway) drains into a proposed street curb inlet and ultimately drains into MWS-1 for treatment within the DMA-1 which will be swapped in exchange with the DMA 1.2 that cannot drain into either two MWS for treatment.

) for hydromodification control.

7.2.2 Structural BMP Summary Table (Complete for all proposed structural BMPs)

- List and provide the information requested below for all pollutant control and hydromodification management BMPs proposed for the project.
- For each BMP listed, complete the Structural BMP Checklist on the next page. Copy the Checklist as many times as needed.

BMP ID #	DMA #	DMA Area (ft²)	Structural BMP Type							Permit # and Sheet #
			Harvest and Use	Infiltration	Unlined Biofiltration	Lined Biofiltration	Flow-thru treatment	Hydromodification Management [1]	Other	
1.1	1	65,505	☐	☐	☐	☒	☐	☐	☐	PDS2023-MUP-23-013
1.2	1		☐	☐	☐	☐	☐	☒	☐	
2	2	31,126	☐	☐	☐	☒	☐	☒	☐	PDS2023-MUP-23-013
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	

Copy and Paste table here for additional BMPs

[1] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # 1.1,	**Permit # and Sheet #** PDS2023-MUP-23-013
BMP Type	
Infiltration ☐ Infiltration basin (INF-1) ☐ Bioretention (INF-2) ☐ Permeable pavement (INF-3) **Unlined Biofiltration** ☐ Biofiltration with partial retention (PR-1) **Lined Biofiltration** ☐ Biofiltration (BF-1) ☐ Nutrient Sensitive Media Design (BF-2) ☒ Proprietary Biofiltration (BF-3)	**Harvest and Use** ☐ Cistern (HU-1) **Flow-thru Treatment** (describe below) ☐ With prior lawful approval to meet earlier PDP requirements ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2] ☐ With alternative compliance **Hydromodification Management**[3] ☐ Detention pond or vault ☐ **Other** (describe below)
BMP Purpose	
☒ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification	☐ Pre-treatment/forebay for another BMP ☐ Other (describe below)
BMP Verification (See BMPDM Section 8.3)	
Provide name and contact information for the party responsible to sign BMP verification forms	Chabad RSF

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)				
BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Discussion (As needed; Continue on subsequent pages as necessary)				

Copy and Paste table here for additional BMPs

[2] Indicate which onsite retention or biofiltration BMP the pre-treatment/forebay serves.
[3] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # 1.2,	**Permit # and Sheet #** PDS2023-MUP-23-013
BMP Type	
Infiltration ☐ Infiltration basin (INF-1) ☐ Bioretention (INF-2) ☐ Permeable pavement (INF-3) **Unlined Biofiltration** ☐ Biofiltration with partial retention (PR-1) **Lined Biofiltration** ☐ Biofiltration (BF-1) ☐ Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3)	**Harvest and Use** ☐ Cistern (HU-1) **Flow-thru Treatment** (describe below) ☐ With prior lawful approval to meet earlier PDP requirements ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2] ☐ With alternative compliance **Hydromodification Management**[3] ☒ Detention pond or vault ☐ **Other** (describe below)
BMP Purpose	
☐ Pollutant control only ☒ Hydromodification control only ☐ Combined pollutant control and hydromodification	☐ Pre-treatment/forebay for another BMP ☐ Other (describe below)
BMP Verification (See BMPDM Section 8.3)	
Provide name and contact information for the party responsible to sign BMP verification forms	Chabad RSF

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)				
BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA ☐ Other (describe):	☒ Property Owner	☐ County	
Maintenance of BMP into perpetuity	☐ HOA ☐ Other (describe):	☒ Property Owner	☐ County	
Discussion (As needed; Continue on subsequent pages as necessary)				

Copy and Paste table here for additional BMPs

[2] Indicate which onsite retention or biofiltration BMP the pre-treatment/forebay serves.
[3] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID # 2	**Permit # and Sheet #** PDS2023-MUP-23-013
BMP Type	
Infiltration ☐ Infiltration basin (INF-1) ☐ Bioretention (INF-2) ☐ Permeable pavement (INF-3) **Unlined Biofiltration** ☐ Biofiltration with partial retention (PR-1) **Lined Biofiltration** ☐ Biofiltration (BF-1) ☐ Nutrient Sensitive Media Design (BF-2) ☒ Proprietary Biofiltration (BF-3)	**Harvest and Use** ☐ Cistern (HU-1) **Flow-thru Treatment** (describe below) ☐ With prior lawful approval to meet earlier PDP requirements ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2] ☐ With alternative compliance **Hydromodification Management**[3] ☐ Detention pond or vault ☐ **Other** (describe below)
BMP Purpose	
☒ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification	☐ Pre-treatment/forebay for another BMP ☐ Other (describe below)
BMP Verification (See BMPDM Section 8.3)	
Provide name and contact information for the party responsible to sign BMP verification forms	Chabad RSF

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)				
BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA ☐ Other (describe):	☒ Property Owner	☐ County	
Maintenance of BMP into perpetuity	☐ HOA ☐ Other (describe):	☒ Property Owner	☐ County	
Discussion (As needed; Continue on subsequent pages as necessary)				

Copy and Paste table here for additional BMPs

[2] Indicate which onsite retention or biofiltration BMP the pre-treatment/forebay serves.
[3] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.4 Storm Water Pollutant Control Worksheet Calculations

- Use this page as a cover sheet for the submittal of any required worksheets below.
- Complete the checklist to identify which BMPDM Appendix B (Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods) worksheets are included with this attachment.
- See BMPDM Appendix B for an explanation of the applicability of individual worksheets and detailed guidance on their completion.

Worksheet	Requirement
☒ Worksheet B.1 Calculation of Design Capture Volume (DCV)	Required
☒ Worksheet B.2 Retention Requirements	Required
☒ Worksheet B.3 BMP Performance	Required
☐ Worksheet B.4 Major Maintenance Intervals for Reduced-sized BMPs	If applicable
☐ Other worksheets	As required

7.5 Identification and Narrative of Receiving Water and Pollutants of Concern

- Complete this sub-attachment *only if flow-thru treatment BMPs are implemented onsite* in lieu of retention or biofiltration BMPs. Unless excepted because of a Prior Lawful Approval[4], PDPs must also participate in an alternative compliance program[5].

A. General Description

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

N/A. Site is not participating in Alternative Compliance Program.

The project site runoff, after being treated by two MWS and detained by underground chamber system, discharge offsite into low point located on the east driveway and ultimately drain into lined channel located on the southeast of the site (south of Via De Valle) and then into San Dieguito River.

B. Water Body Impairments and Priorities

List any 303(d) impaired water bodies[6] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
San Dieguito River	Chloride, Oxygen, Dissolved, Oxygen, Nitrogen, Phosphorus, Total Dissolved Solids, Benthic Community, Pyrethroids, Bifenthrin	Indicator Bacteria

C. Identification of Project Site Pollutants

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix J.5)

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	☐	☐	☐

[4] See BMPDM Appendix L: Prior Lawful Approval Requirements and Guidance.

[5] See SWQMP Attachment 12 (Alternative Compliance Projects) and BMPDM Appendix J (Offsite Alternative Compliance Requirements and Guidance).

[6] The current list of Section 303(d) impaired water bodies can be found at: https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2014_2016.shtml

Bacteria & Viruses	☐	☐	☐
Pesticides	☐	☐	☐

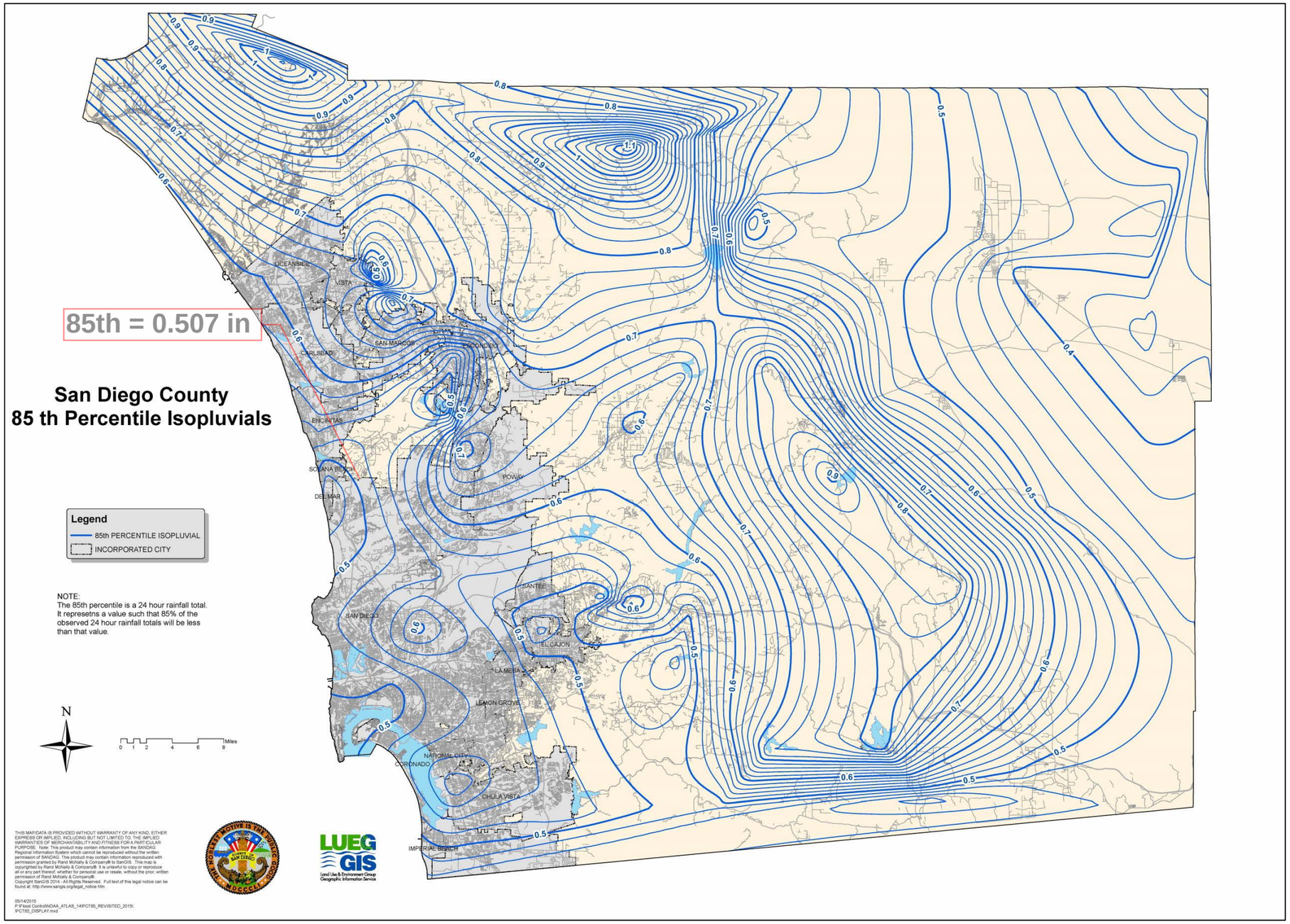


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

Table | Zoom to

CONTOUR	5.00
INCHES	0.50

85th Percentile = 0.507 in

Rancho Santa Fe
Osuna Valley
Fairbanks Ranch
Lusardi Creek Preserve
The Crosby Club
La Jolla Valley
Cardiff State Beach
Solana Beach
Lomas Santa Fe Country Club
Morgan Run Club and Resort
Fairbanks Ranch Country Club
The Santaluz Club
Black Mountain
San Dieguito Valley
Gonzales Canyon
North City
Del Mar
Del Mar Heights
Torrey Pines State Beach
Carmel Valley
Del Mar Mesa
Soledad Valley
Los Peñasquitos Canyon
Torrey Highlands
Rancho Penasquitos
Ted Williams Fwy
Carmel Valley Rd
La Zanja Canyon
Deer Canyon
McGonigle Canyon
El Camino Real
Del Mar Heights Rd
Carmel Mountain Rd
Calle Cristobal
Westonhill Dr
Ragweed St
Park Village Rd
Mira Mesa Blvd
Camino del Sur
Paseo del Sur
Puerta del Sol
El Secreto
San Elijo Ave
Mimulus
El Vuelo
El Mirlo
Manchester Ave
Granada
Canyon Rd
Carmel Valley Rd
841 ft
S6
S8
S9
S21
56
5
15

Table Zoom to

CONTOUR	5.20
INCHES	0.52

85th Percentile = 0.507 in

Osuna Valley
Calzada del Bosque
Circa del Norte
Real
Puerta del Sol
357 ft
Las Plantaderas
Las Palomas
S6
Via Lago Azul
Fairbanks Ranch
El Apajo
Iluminado
Encenido
Sun Valley Rd
Via Cazadero
Camino del Sur
Lomas Santa Fe Country Club
Stevens Ave
Ida Ave
S Highway 101
San Andres Dr
Vista de la Tierra
Morgan Run Club and Resort
San Dieguito Rd
Rancho Diegueno Rd
The Farms Golf Club
Rancho Santa Fe Farms Dr
Fairbanks Ranch Country Club
Del Mar Surfside Race Place
Calle Carla
La Zarza Canyon
Via Abertura
Del Mar Country Club
319 ft
Sagebrush Bend Way
Gonzales Canyon
Kerry Ln
56
San Dieguito Valley
Camino del Mar
San Dieguito Dr
North City
Half Mile Dr
High Bluff Dr
McGonigle Canyon
Del Mar
Torrey Pines High
Lansdale Dr
Cathedral Catholic High School
Torrey Santa Fe Rd
387 ft
Santa Monica Ridge
11th St
Graydon Rd
Ashley Falls Dr
Deer Canyon
Mango Dr
Del Mar Heights Rd
Townsgate Dr
Del Mar Heights
Ted Williams Fwy
Carmel Valley

RETENTION VOLUME CALCULATION USING

SAN DIEGO COUNTY WORKSHEET TO CALCULATE DCV &
CITY OF SAN DIEGO WORKSHEET TO CALCULATE VOLUME RETENTION CALCULATION

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	DMA-1	DMA-2	
	2	85th Percentile 24-hr Storm Depth	0.51	0.51	
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	49,240	24,934	
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)			
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)			
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)			
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)			
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)			
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)	16,265	6,192	
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)			
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)			
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)			
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)			
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)			
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)			
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)			
	18	Number of Tree Wells Proposed per SD-A			
	19	Average Mature Tree Canopy Diameter			
	20	Number of Rain Barrels Proposed per SD-E			
	21	Average Rain Barrel Size			
Initial Runoff Factor Calculation	22	Total Tributary Area	65,505	31,126	0
	23	Initial Runoff Factor for Standard Drainage Areas	0.75	0.78	0.00
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00
	25	Initial Weighted Runoff Factor	0.75	0.78	0.00
	26	Initial Design Capture Volume	2,088	1,032	0
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0
	28	Total Pervious Dispersion Area	0	0	0
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00
	31	Runoff Factor After Dispersion Techniques	0.75	0.78	n/a
	32	Design Capture Volume After Dispersion Techniques	2,088	1,032	0
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0
	34	Total Rain Barrel Volume Reduction	0	0	0
Results	35	Final Adjusted Runoff Factor	0.75	0.78	0.00
	36	Final Effective Tributary Area	49,129	24,278	0
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0
	38	Final Design Capture Volume Tributary to BMP	2,088	1,032	0

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	*iii*
Basic Analysis	1	Drainage Basin ID or Name	DMA-1	DMA-2	-
	2	85th Percentile Rainfall Depth	0.51	0.51	-
	3	Predominant NRCS Soil Type Within BMP Location	D	D	D
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted	Unrestricted
	5	Nature of Restriction	Soil Type	Soil Type	n/a
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No	No
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	Yes	Yes	Yes
	9	Design Infiltration Rate Recommended by Geotechnical Engineer	0.019	0.019	0.019
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	0.019
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	1.5%
	12	Fraction of DCV Requiring Retention	0.02	0.02	0.01
	13	Required Retention Volume	42	21	0

No Warning Messages

The City of SAN DIEGO	Project Name	Chabad Rancho Santa Fe	
	BMP ID	RETENTION VOLUME CREDIT FOR DMAs (1+2)	
Volume Retention From Amended Soils		Worksheet B.5-7	
1	Impervious area draining to the pervious area	4967	sq. ft.
2	Pervious area (must meet the requirements in SD-B and SD-F Fact Sheets)	2280	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not applicable when Line 3 > 50 or Line 3 < 0.25	2.18	
4	Adjusted runoff factor [(Line 1 * 0.9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.65	
5	85th percentile 24-hour rainfall depth	0.51	inches
6	Design capture volume [(Line 1 + Line 2) x Line 4 x (Line 5/12)]	200	cu. ft.
7	Amendment Depth (Choose from 3", 6", 9", 12", 15" and 18")	12	inches
8	Storage [(porosity – field capacity) + 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7/12) * Line 8]	570	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]	2.85	
11	Measured Infiltration Rate 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 enter 0.05	0.019	in/hr.
12	Factor of Safety	2	
13	Reliable Infiltration Rate [Line 11/Line 12]	0.0095	in/hr.
14	Dispersion Credit (Based on Figures B.5.6 to B.5.11; Line 10 and Line 13)	0.463	
15	Volume retention due to amendment [Line 1 * (Line 5/12) * Line 14]	98	cu. ft.

The City of SAN DIEGO	Project Name	Chabad Rancho Santa Fe
	BMP ID	RETENTION VOLUME CREDIT FOR DMAs (1+2)

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP							sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)							
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						0	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						0	sq. ft.
5	Biofiltration BMP Footprint							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]						0	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]						0	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						63	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						63	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
	1	Credit volume gained from Proposed Amended Soil					98	cu. ft.
	2	Per Worksheet B.5-7						cu. ft.
	3							cu. ft.

This document was created by an application that isn't licensed to use novaPDF.
Purchase a license to generate PDF files without this notice.

Modular Wetland System Sizing

MWS Linear 2.0 Flow Based Sizing Calculations -

California Region (Northern, Central, and Southern Regions)

Model #	Physical Depth of Model from TC, FS, or TC to INVERT OUT	Wetland Chamber Perimeter (ft)	**Wetland Chamber Max HGL Height (ft)	Wetland Chamber Surface Area (sq ft)	Treatment Capacity for Flow Based Design **FLOW DESIGN**	
					GPM	CFS
MWS-L-4-4	4.13'	6.7	3.40	22.78	**23.46**	**0.052**
MWS-L-4-6	4.13'	9.4	3.40	31.96	**32.92**	**0.073**
MWS-L-4-8	4.13'	14.8	3.40	50.32	**51.83**	**0.115**
MWS-L-4-13	4.13'	18.4	3.40	62.56	**64.44**	**0.144**
MWS-L-4-15	4.13'	22.4	3.40	76.16	**78.44**	**0.175**
MWS-L-4-17	4.13'	26.4	3.40	89.76	**92.45**	**0.206**
MWS-L-4-19	4.13'	30.4	3.40	103.36	**106.46**	**0.237**
MWS-L-4-21	4.13'	34.4	3.40	116.96	**120.47**	**0.268**
MWS-L-6-8	4.13'	18.8	3.40	63.92	**65.84**	**0.147**
MWS-L-8-8	4.13'	29.6	3.40	100.64	**103.66**	**0.231**
MWS-L-8-12	4.13'	44.4	3.40	150.96	**155.49**	**0.346**
MWS-L-8-16	4.13'	59.2	3.40	201.28	**207.32**	**0.462**
MWS-L-8-20	4.13'	74.0	3.40	251.60	**259.15**	**0.577**
MWS-L-8-24	4.13'	88.8	3.40	301.92	**310.98**	**0.693**

The model will be customized to handle 0.167 cfs

DMA-2

DMA-1

Shallow or Deeper Units Available. Change in Height Will Affect Treatment Capacity

** Not the physical height of the unit but the max HGL in the system at peak treatment flow rate

Based on loading rate of 100 in/hr or 1.03 gpm/sq ft

MODULAR WETLANDS

Modular Wetland Systems, Inc. **Copyright 2013** **www.modularwetlands.com**

info@modularwetlands.com **P: 760-433-7640** **2972 San Luis Rey Rd, Oceanside CA 92058**

Modular Wetland System Sizing (IMP-1)

Required Flow Rate Capacity = 1.5 x Q

Q = C x I x A
C 0.75 ((49473)+(0.3*16512))/(65985)
Q = 0.75 x 0.2 x 1.504

Q = 0.226 cfs

Required Flow Rate Capacity = 1.5 x 0.226

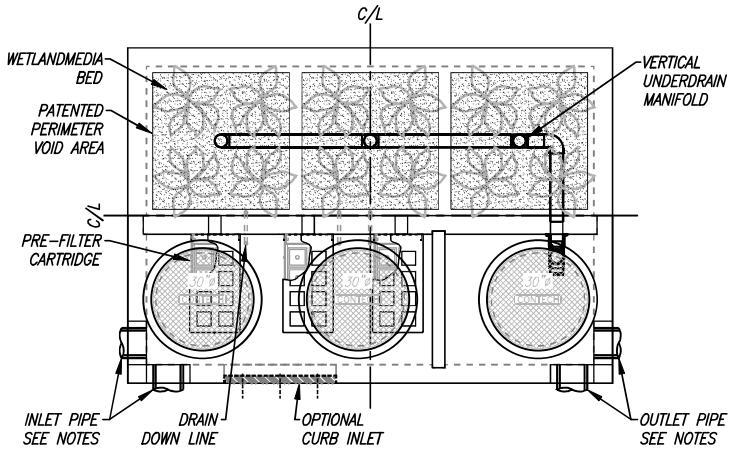
Required Flow Rate Capacity = 0.339 cfs

Manufacturer Flow Rate Treatment Capacity = 0.346 cfs

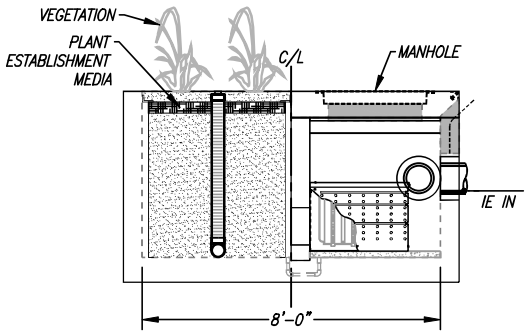
Proposed Model: MWS-L-8-12

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	Chabad Rancho Santa Fe		
PROJECT LOCATION	14906 Via De La, Ranch Santa Fe, CA		
STRUCTURE ID	IMP-1.1		
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.346
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



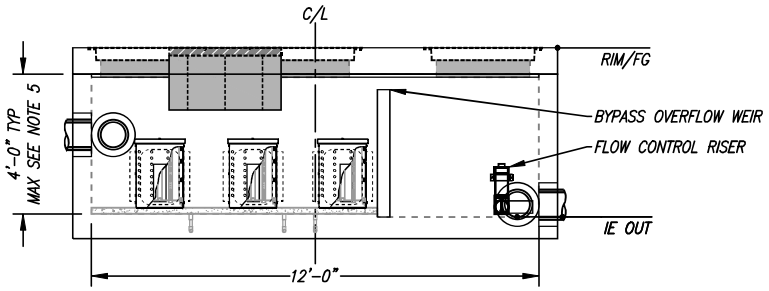
PLAN VIEW



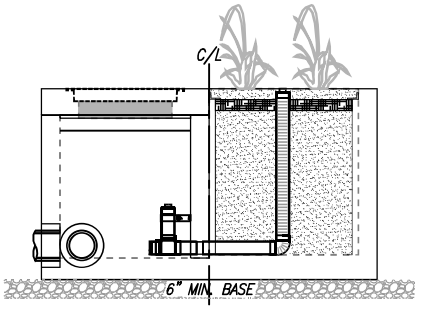
LEFT END VIEW

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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

8/14/2020 8:47:47 AM C:\ASCOT\SKETCH

Modular Wetland System Sizing (IMP-2)

Required Flow Rate Capacity = 1.5 x Q

Q = C x I x A
C 0.78 ((0.9*24934)+(0.3*6192))/(31126)
Q = 0.78 x 0.2 x 0.715

Q = 0.112 cfs

Required Flow Rate Capacity = 1.5 x 0.112

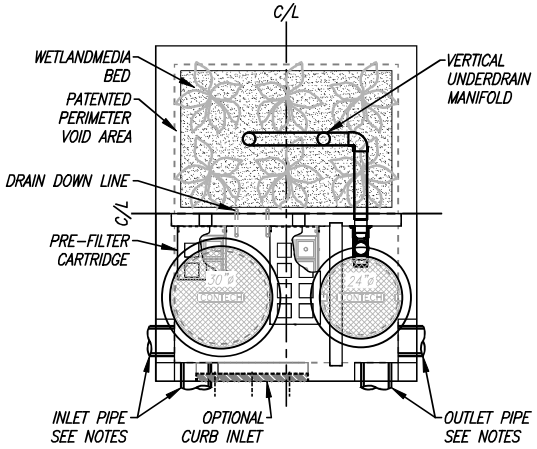
Required Flow Rate Capacity = 0.167 cfs

Manufacturer Flow Rate Treatment Capacity = cfs

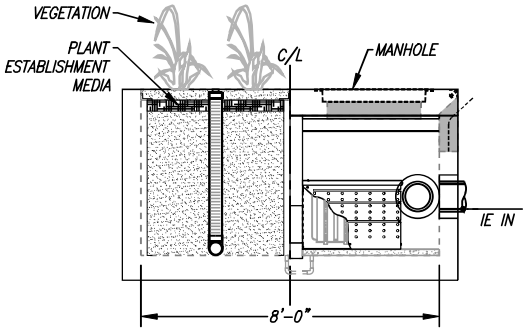
Proposed Model: MWS-L-6-8 (Designer will customize it to have a capacity to handle 0.167 cfs)

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME	Chabad Rancho Santa Fe		
PROJECT LOCATION	14906 Via De La, Rancho Santa Fe, CA		
STRUCTURE ID	IMP-2		
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.167
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

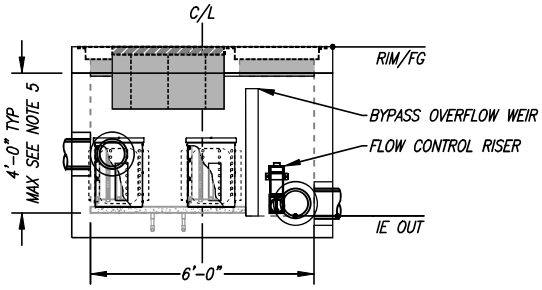
* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



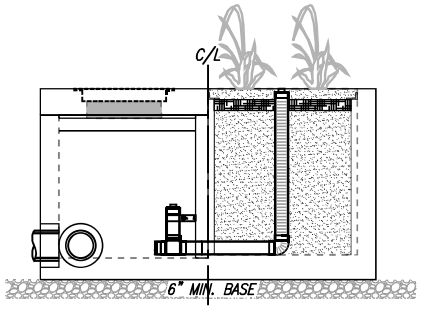
PLAN VIEW



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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

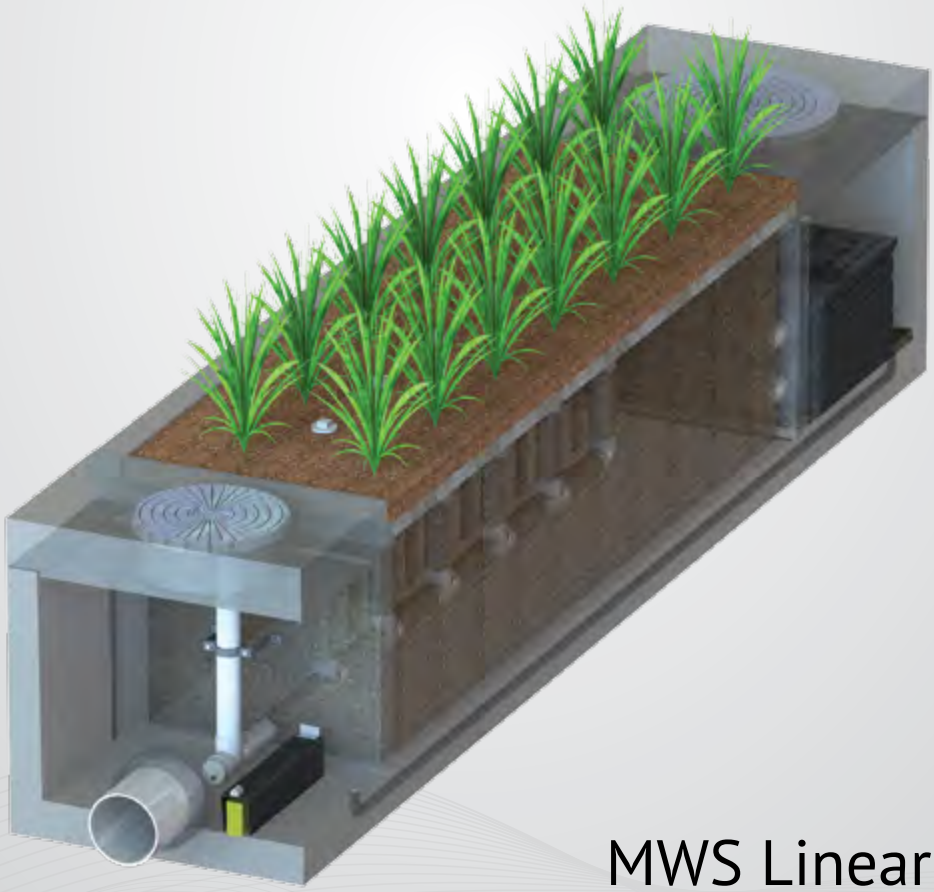
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-6-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

8/14/2020 8:47:14 AM

MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*



MWS Linear



Contents

1 Introduction

2 Applications

3 Configurations

4 Advantages

5 Operation

6 Orientations | Bypass

7 Performance | Approvals

8 Sizing

9 Installation | Maintenance | Plants

The Urban Impact

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



Plant A Wetland

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





MWS Linear

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

Applications

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



Industrial

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



Residential

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



Streets

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



Parking Lots

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



Commercial

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



Mixed Use

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

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

- Agriculture
- Reuse
- Low Impact Development
- Waste Water





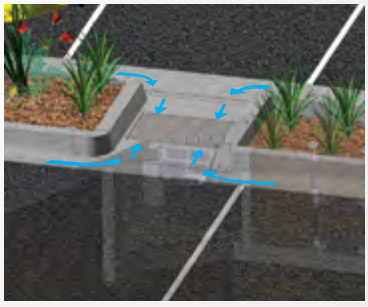
Configurations

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



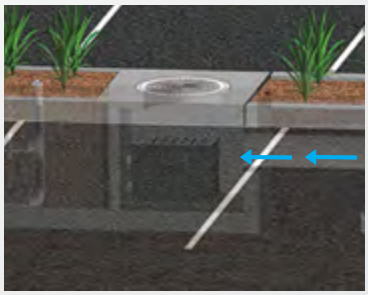
Curb Type

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



Grate Type

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



Vault Type

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



Downspout Type

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

Advantages & Operation

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

Featured Advantages

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

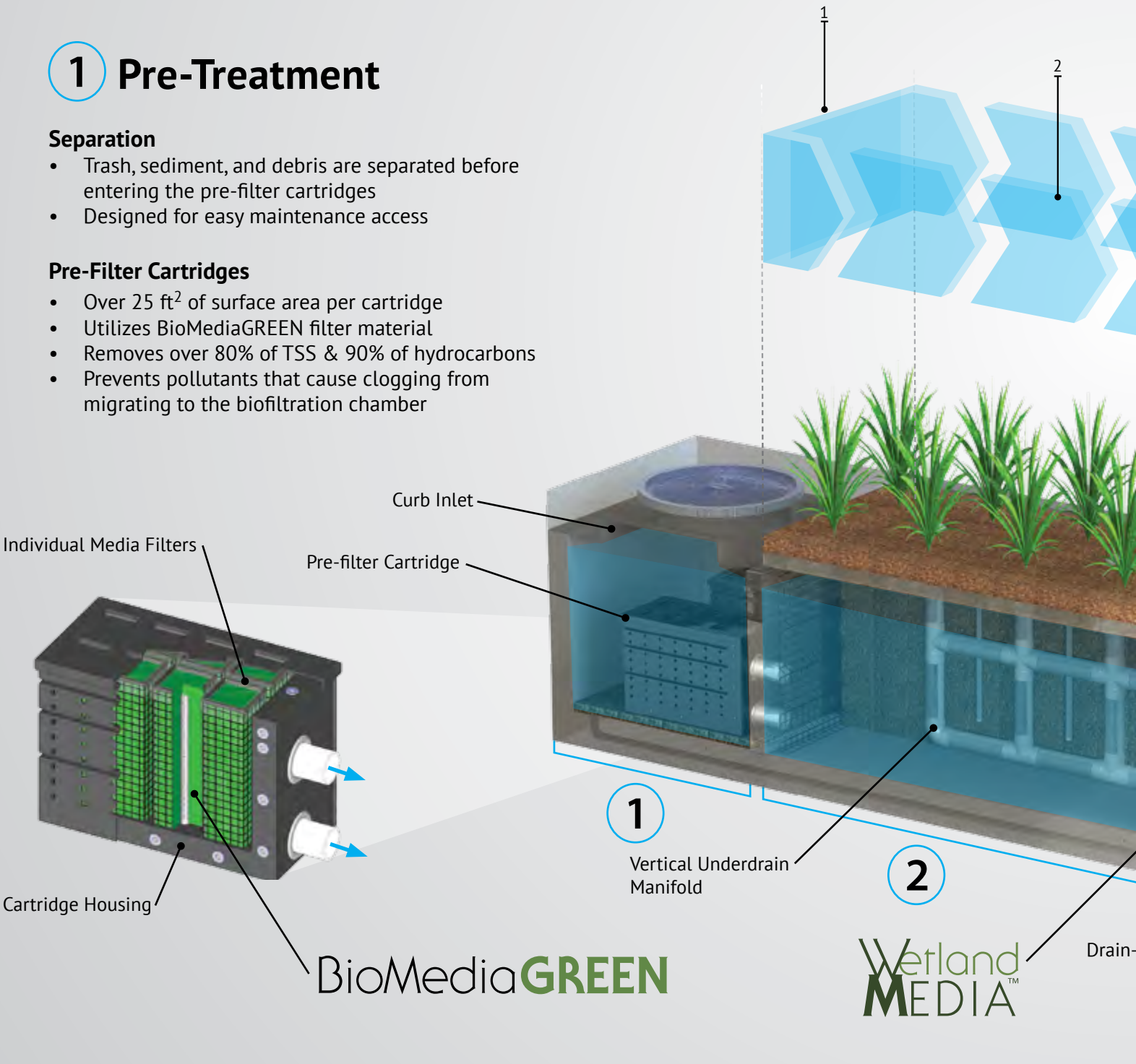
1 Pre-Treatment

Separation

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

Pre-Filter Cartridges

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



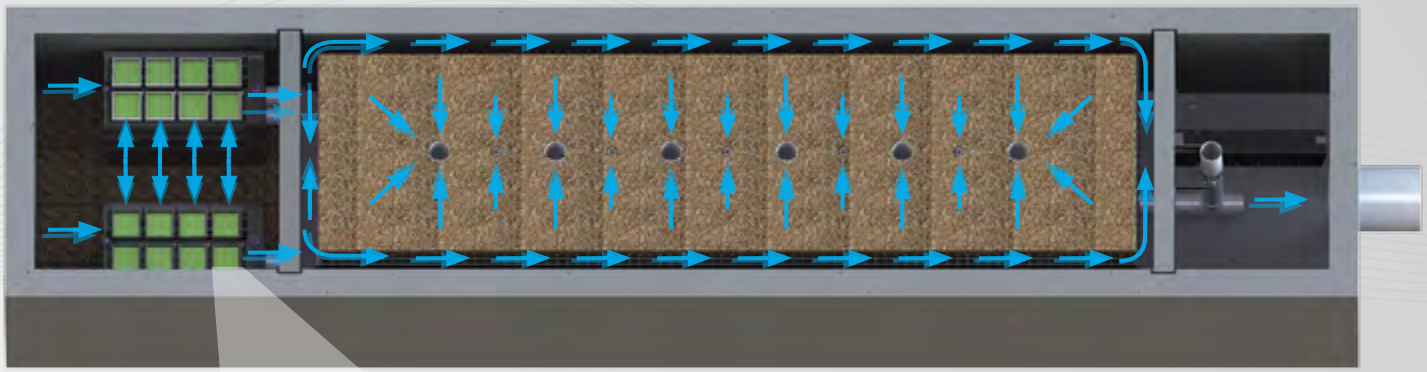


Fig. 2 - Top View

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



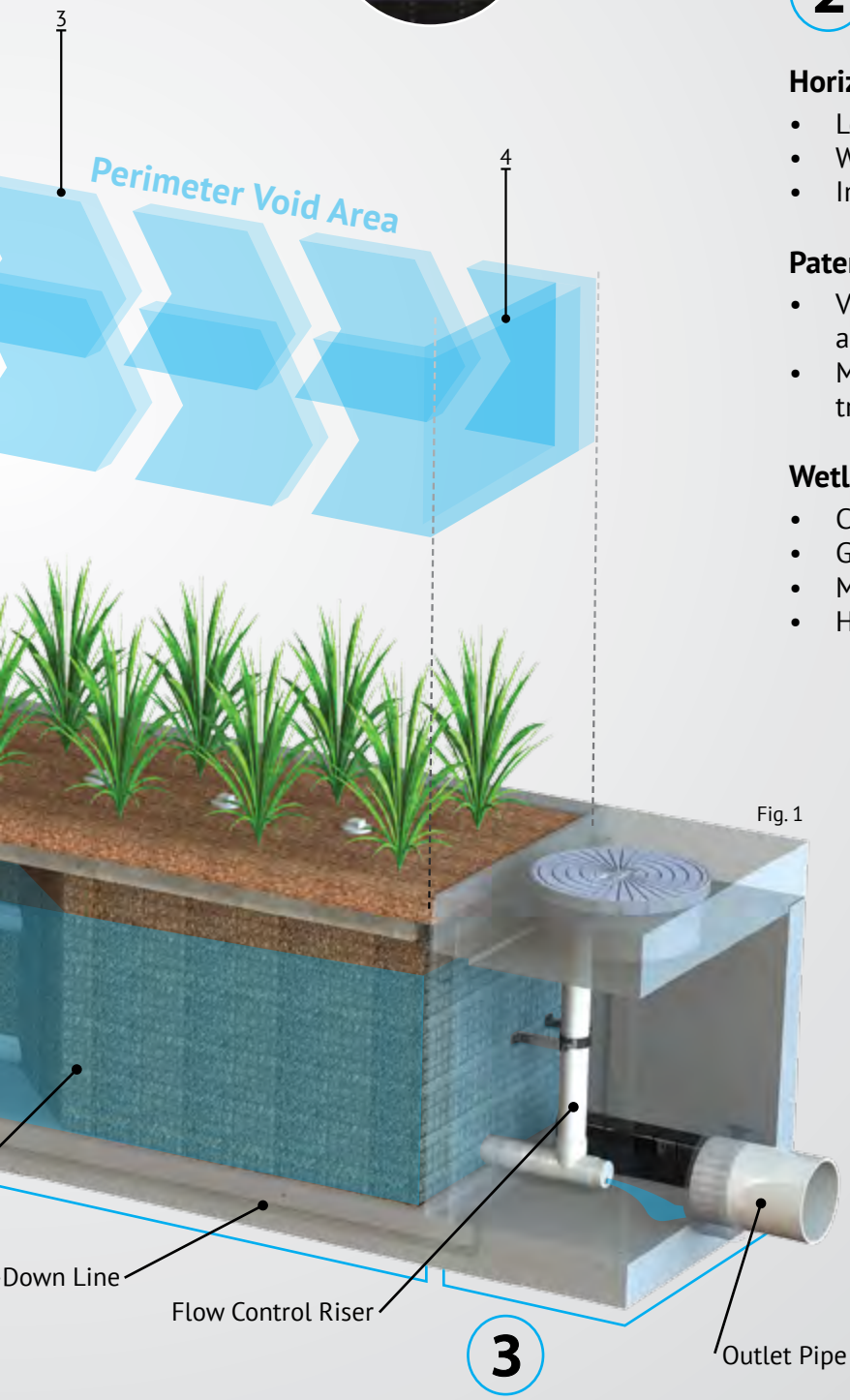


Fig. 1

2 Biofiltration

Horizontal Flow

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

Patented Perimeter Void Area

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

WetlandMEDIA

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

3 Discharge

Flow Control

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

Drain-Down Filter

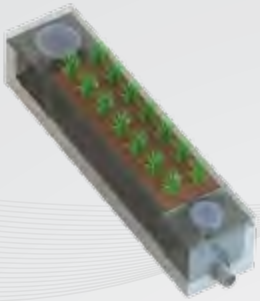
- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations



Side-By-Side

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



End-To-End

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

Bypass

Internal Bypass Weir (Side-by-Side Only)

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

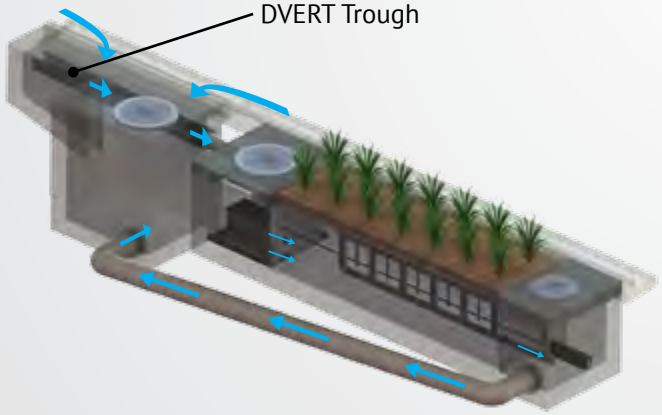
External Diversion Weir Structure

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

Flow By Design

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

DVERT Low Flow Diversion



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





Performance

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

Approvals

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



Washington State DOE Approved

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

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



DEQ Assignment

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



MASTEP Evaluation

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



Rhode Island DEM Approved

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

Flow Based Sizing

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

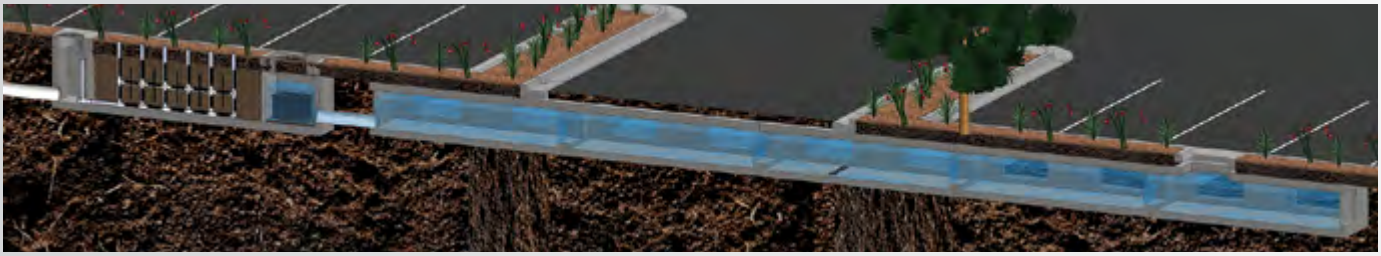


Treatment Flow Sizing Table

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

Volume Based Sizing

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



Treatment Volume Sizing Table

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

Installation

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

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



Maintenance

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

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



Plant Selection

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

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

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



WASHINGTON STATE DEPARTMENT OF ECOLOGY

January 2024

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS) METALS AND PHOSPHORUS TREATMENT

For

Contech Engineered Solutions, LLC (Contech) Modular Wetlands Linear

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 Modular Wetlands Linear Stormwater Treatment System for Basic, Phosphorus, and Metals treatment
    - Sized at a hydraulic loading rate of:
        - 1 gallon per minute (gpm) per square foot (sq ft) of Wetland Cell Surface Area
        - Prefilter box (approved at either 22 inches or 33 inches tall)
            - 3.0 gpm/sq ft of prefilter box surface area for moderate pollutant loading rates (low to medium density residential basins).
            - 2.1 gpm/sq ft of prefilter box surface area for high pollutant loading rates (commercial and industrial basins).
2. Ecology approves the Modular Wetlands Linear Stormwater Treatment System units for Basic, Phosphorus, and Metals 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 water quality treatment design 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 water quality treatment design flow rate as calculated using one of the three methods described in Chapter 2.7.6 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality treatment design flow rate is the full 2-year release rate of the detention facility.

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

Ecology's Conditions of Use

Applicants shall comply with the following conditions:

1) Design, assemble, install, operate, and maintain the Modular Wetlands Linear Stormwater Treatment System units, in accordance with Contech's. applicable manuals and documents and the Ecology Decision.
2) Each site plan must undergo Contech review and approval before site installation. This ensures that site grading and slope are appropriate for use of a Modular Wetlands Linear Stormwater Treatment System unit.
3) Modular Wetlands Linear Stormwater Treatment System media shall conform to the specifications submitted to and approved by Ecology.
4) The applicant tested the Modular Wetlands Linear 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 Modular Wetlands Linear 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 stormwater treatment technology.
    - Typically, Contech designs 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 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 the 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 Modular Wetlands Linear Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Contech Engineered Solutions, LLC
Applicant's Address:	11815 NE Glenn Widing Dr. Portland, OR 97220

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, Metals, 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 Modular Wetlands Linear is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/L.
- The Modular Wetlands Linear 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 Modular Wetlands Linear is capable of removing a minimum 30-percent of dissolved copper from stormwater with influent concentrations between 0.005 and 0.020 mg/L.
- The Modular Wetlands Linear is capable of removing a minimum 60-percent of dissolved zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/L.

Ecology's Recommendations:

- Contech has shown Ecology, through laboratory and field-testing, that the Modular Wetlands Linear Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Phosphorus, and Metals treatment goals.

Findings of Fact:

<u>Laboratory Testing</u>

The Modular Wetlands Linear Stormwater Treatment System 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. Contech 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. Contech should use these data to establish required maintenance cycles.
2. Contech should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Contech will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:

Download at https://www.conteches.com/modular-wetlands

Contact Information:

Applicant: Jeremiah Lehman
Contech Engineered Solutions, LLC
11815 NE Glenn Widing Dr.
Portland, OR 97220
Jeremiah.Lehman@ContechES.com

Applicant website: http://www.conteches.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) 870-0983
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)
December 2019	Revised Manufacturer Contact Address
July 2021	Added additional prefilter sized at 33 inches
August 2021	Changed “Prefilter” to “Prefilter box”
November 2022	Changed Contacts to Contech ES
January 2024	Revised Dissolved Metals (Enhanced) to Metals

Biofilter Products

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity.

The Modular Wetland 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 pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater applications treating rooftops, streetscapes, parking lots, and industrial sites. The MWS Linear can be used for the following applications: industrial, residential, streets, parking lots, commercial, mixed use, agricultural, reuse, low impact development and waste water.

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 pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses nature's ability to process, transform and remove even the most harmful pollutants.

Approvals

Washington State TAPE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced and Phosphorus treatment at 1 gpm/ft2 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) Technical Criteria.

Maryland Department of the Environment Approved

Granted ESD (Environmental Site Design) 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.

Biofilter Products





Orientations

Side-By-Side

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

Internal Bypass Weir (Side-by-Side Only)

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

External Diversion Weir Structure

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

Flow By Design

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

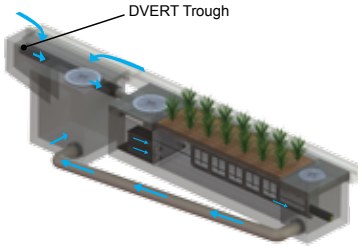
End-To-End

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



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.



Flow Based Sizing

Model#	Dimensions	Wetland Media Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4'x4'	23 sq.ft.	0.052
MWS-L-4-6	4'x6'	32 sq.ft.	0.073
MWS-L-4-8	4'x8'	50 sq.ft.	0.115
MWS-L-4-13	4'x13'	63 sq.ft.	0.144
MWS-L-4-15	4'x15'	76 sq.ft.	0.175
MWS-L-4-17	4'x17'	90 sq.ft.	0.206
MWS-L-4-19	4'x19'	103 sq.ft.	0.237
MWS-L-4-21	4'x21'	117 sq.ft.	0.268
MWS-L-6-8	7'x9'	64 sq.ft.	0.147
MWS-L-8-8	8'x8'	100 sq.ft.	0.230
MWS-L-8-12	8'x12'	151 sq.ft.	0.346
MWS-L-8-16	8'x16'	201 sq.ft.	0.462
MWS-L-8-20	9'x21'	252 sq.ft.	0.577
MWS-L-8-24	9'x25'	302 sq.ft.	0.693

Volume Based Sizing

Model #	Treatment Capacity (cu.ft.) @ 24-Hour Drain Down	Treatment Capacity (cu.ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-6-8	3191	6382
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145
MWS-L-8-20	12560	25120
MWS-L-8-24	15108	30216

Biofilter Products

featured advantages

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

Advantages & Operation

① Pre-Treatment

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

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

② Bio Filtration

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.

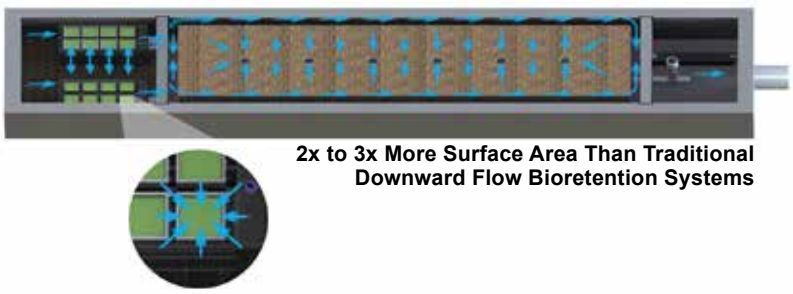
WetlandMEDIA
Contains no organics and removes phosphorus. Greater surface area and 48% void space. Maximum evapo-transpiration. High ion exchange capacity and light weight.

③ Discharge

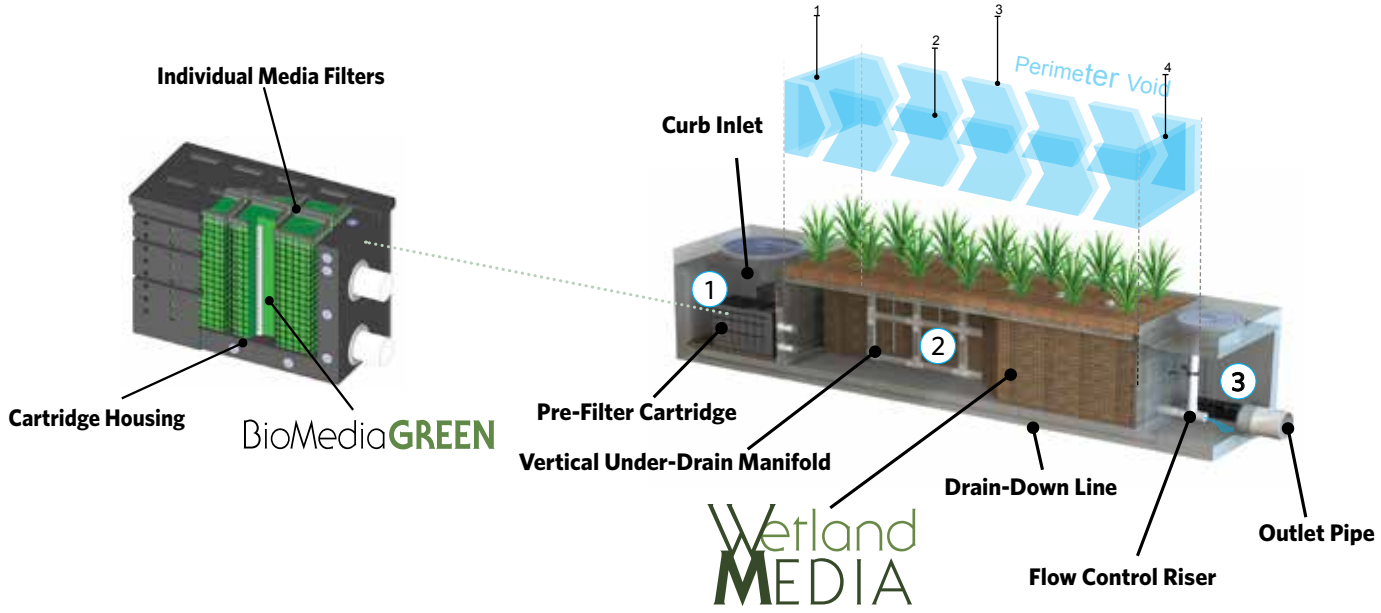
Flow Control
Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity. Extends the life of the media and improves performance.

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

Top View



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



Biofilter Products



Configurations

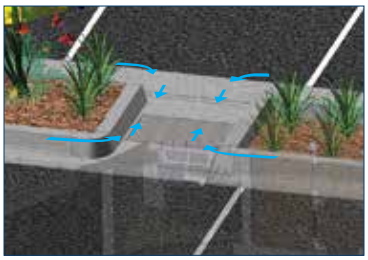
Curb Type

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



Grate Type

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



Vault Type

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



Downspout Type

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



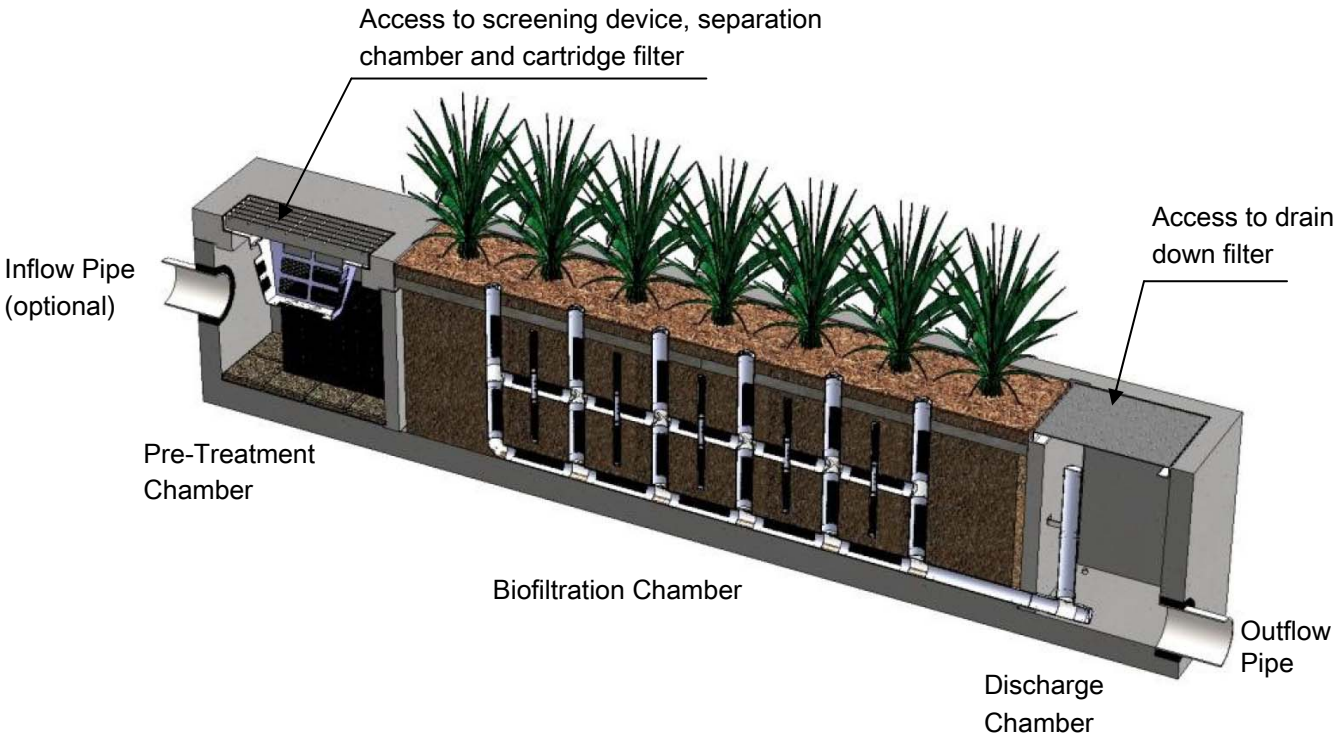


Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.



Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.







Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.







Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.



Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.









Inspection Form



Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes:

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report



Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

Advanced Drainage Systems, Inc.

SiteAssist®
FOR STORMTECH INSTALLATION INSTRUCTIONS VISIT OUR WEBSITE

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
10. MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
11. ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE; AASHTO M43 #3, 357, 4, 467, 5, 56, OR 57.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

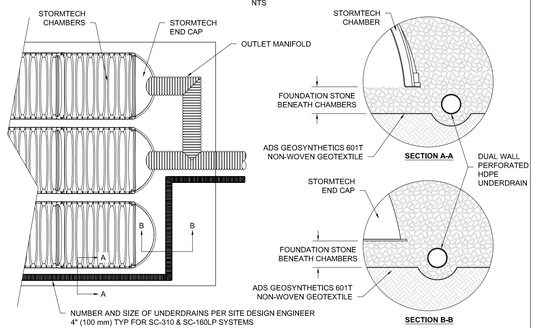
NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

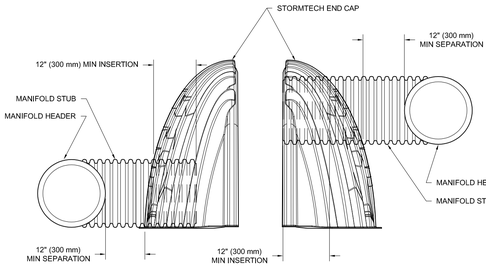
CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

UNDERDRAIN DETAIL
NTS



5 UNDERDRAIN DETAIL

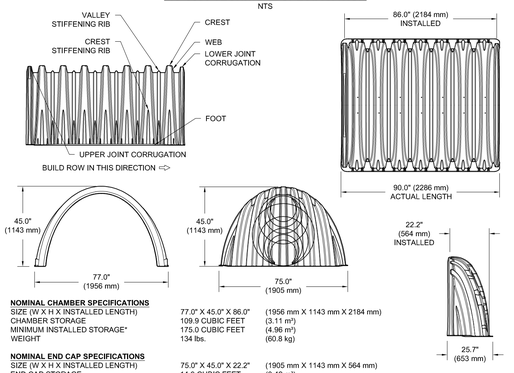
MC-SERIES END CAP INSERTION DETAIL
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

6 MC-SERIES END CAP INSERTION DETAIL

MC-3500 TECHNICAL SPECIFICATION
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" (152 mm) STONE BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

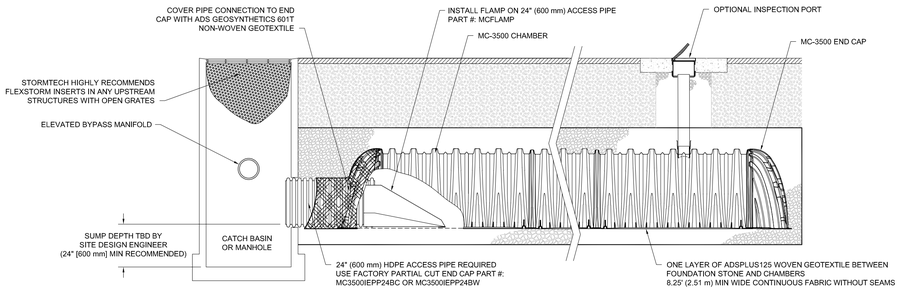
PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

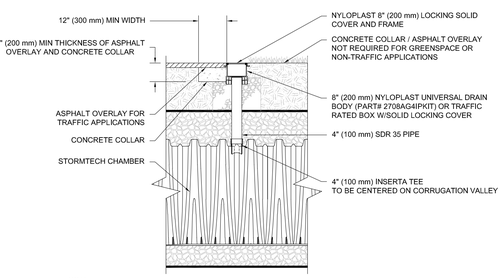
CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-3500 TECHNICAL SPECIFICATIONS



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

3 MC-3500 ISOLATOR ROW PLUS DETAIL



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

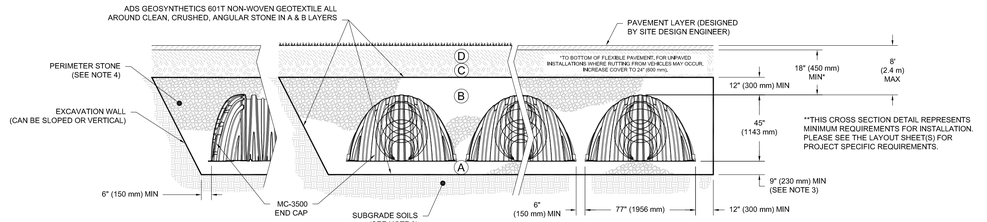
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

4 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 18" (450 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



**THIS CROSS SECTION DETAIL REPRESENTS MINIMUM REQUIREMENTS FOR INSTALLATION. PLEASE SEE THE LAYOUT SHEET(S) FOR PROJECT SPECIFIC REQUIREMENTS.

NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-3500 CROSS SECTION DETAIL

DRAWN: SMW | DATE: 02/17/2025
REVIEWED: JLM | PROJECT NO: 724-390
REV: | NOT TO SCALE

MC-3500 STANDARD DETAILS

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026

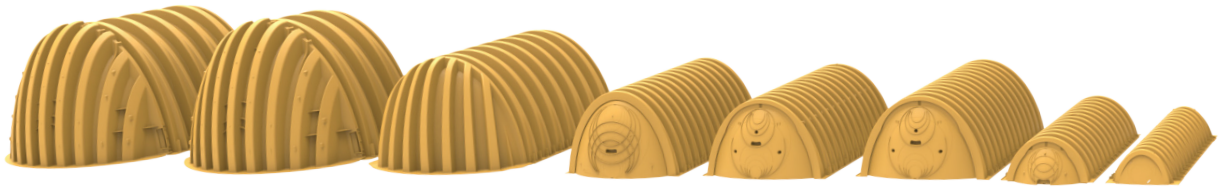
Advanced Drainage Systems, Inc.

SHEET 1

ADVANCED DRAINAGE SYSTEMS, INC. ("ADS") HAS PREPARED THIS DETAIL BASED ON REFERENCED STANDARDS. ADS HAS NOT PERFORMED ANY ENGINEERING OR DESIGN SERVICES FOR THIS PROJECT. NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED. THE INSTALLATION DETAILS PROVIDED HEREIN ARE GENERAL RECOMMENDATIONS AND ARE NOT SPECIFIC FOR THIS PROJECT. UNLESS THE PLANS ARE SIGNED AND SEALED BY THE SITE DESIGN ENGINEER. THE SITE DESIGN ENGINEER'S RESPONSIBILITY TO ENSURE THE DETAILS PROVIDED HEREIN ARE ACCEPTABLE FOR THIS PROJECT.

StormTech® Stormwater Chamber System

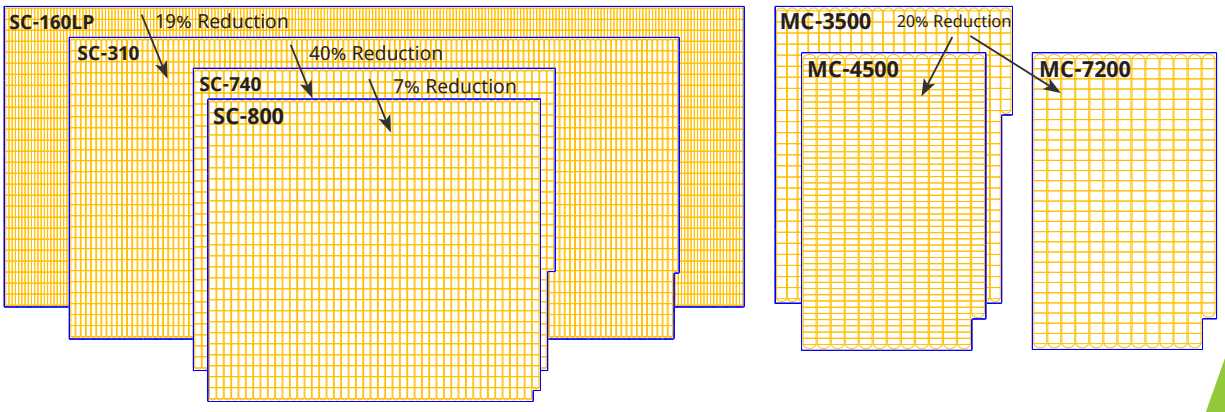
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



MC-7200 MC-4500 MC-3500 SC-800 DC-780 SC-740 SC-310 SC-160LP

Product Specifications	MC-7200	MC-4500	MC-3500	SC-800	DC-780	SC-740	SC-310	SC-160LP
Height, in. (mm)	60 (1524)	60 (1524)	45 (1143)	33 (838)	30 (762)	30 (762)	16 (406)	12 (305)
Width, in. (mm)	100 (2540)	100 (2540)	77 (1956)	51 (1295)	51 (1295)	51 (1295)	34 (864)	25 (635)
Length, in. (mm)	83.4 (2120)	52.0 (1321)	90.0 (2286)	90.6 (2301)	90.7 (2304)	90.7 (2304)	90.7 (2304)	90.7 (2304)
Installed length, in. (mm)	79.1 (2010)	48.3 (1227)	86.0 (2184)	85.4 (2169)	85.4 (2169)	85.4 (2169)	85.4 (2169)	85.4 (2169)
Bare Chamber Storage, cf (cm)	175.9 (4.98)	106.5 (3.01)	109.9 (3.11)	50.6 (1.43)	46.2 (1.3)	45.9 (1.3)	14.7 (0.42)	6.85 (0.19)
Stone above, in. (mm)	12 (305)	12 (305)	12 (305)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)
Minimum stone below, in. (mm)	9 (229)	9 (229)	9 (229)	6 (152)	9 (229)	6 (152)	6 (152)	4 (102)
Row spacing, in. (mm)	9 (229)	9 (229)	6 (152)	6 (152)	6 (152)	6 (152)	3 (76)	N/A
Minimum installed storage, cf (cm)	267.3 (7.56)	162.6 (4.60)	175 (4.96)	81 (2.29)	78.4 (2.20)	74.9 (2.12)	29.3 (0.83)	14.9 (0.42)
Storage per unit area, cf/sf (cm/sm)	4.46 (1.35)	4.44 (1.35)	3.53 (1.07)	2.39 (0.72)	2.31 (0.70)	2.21 (0.67)	1.3 (0.39)	1 (0.30)
Max cover from ground, in. (mm)	84 (2133)	84 (2133)	96 (2438)	96 (2438)	144 (3657)	96 (2438)	96 (2438)	120 (3048)

Example: Footprint Comparison-100,000 CF Project



ADS StormTech™

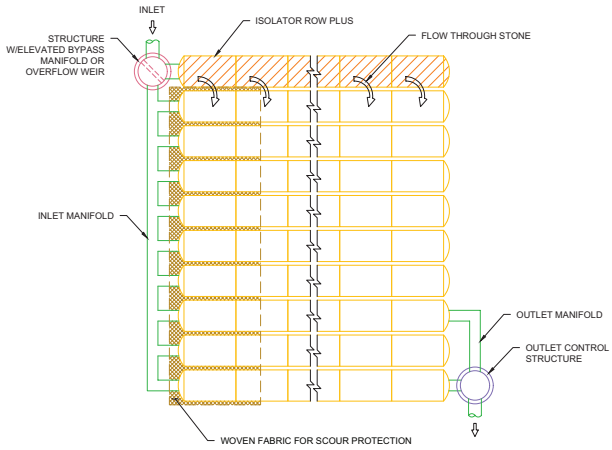
StormTech Isolator® Row Plus

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

The Isolator Row Plus is a row of StormTech chambers that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers allow stormwater to flow vertically out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

StormTech Isolator Row Plus Schematic
(not to scale)





StormTech Design Tool

Initial layouts and reports provide a visual understanding of various options and is the first step to choosing the design direction and evaluating potential cost.

- Generate quick layouts
- Import site plans & maps
- Customize layouts
- Save, manage, revise
- +2 Multi-bed system design



Visit **adspipe.com/stormtech/design-tool**

StormTech™

Visit our Website

adspipe.com
800-821-6710

ADS "Terms and Conditions of Sale" are available on the ADS website, www.ads-pipe.com
The ADS logo and the Green Stripe are registered trademarks of Advanced Drainage Systems, Inc.
StormTech® and Isolator® Row are registered trademark of StormTech, Inc.
© 2025 Advanced Drainage Systems, Inc. #11142 1/25 CS

StormTech®
Product Catalog



ADS StormTech™

StormTech Subsurface Stormwater Management

Table of Contents

Product Features and Benefits 2
SC-160LP 4
SC-310 6
SC-310-3 8
SC-740 10
DC-780 12
SC-800 14
MC-3500 16
MC-4500 18
MC-7200 20
Isolator® Row Plus 22
StormTech Design Tool 24
Products and Services 26

The ADS Design Tool 2.0 will help designers, owners and contactors design conceptual layouts and cost estimates.

Now available at https://designtool.ads-pipe.com



StormTech Subsurface Stormwater Management

StormTech has thousands of chamber systems in service throughout the world. All StormTech chambers are designed to meet the most stringent industry performance standards for superior structural integrity. The StormTech system is designed primarily to be used under parking lots, roadways and heavy earth loads saving valuable land and protecting water resources for commercial and municipal applications. In our continuing desire to answer designers' challenges, StormTech has expanded the family of products providing engineers, developers, regulators and contractors with additional site specific flexibility.

Advanced structural performance for greater long-term reliability

StormTech developed a state of the art chamber design through:

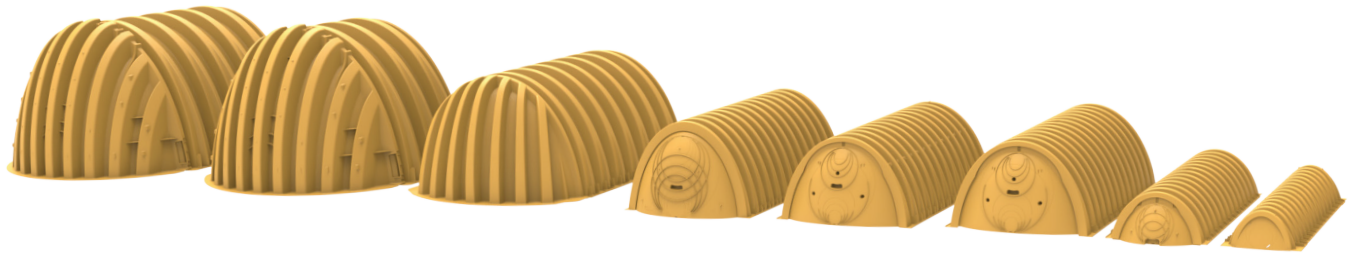
- Collaboration with world-renowned experts of buried drainage structures to develop and evaluate the structural testing program and product design
- Designing chambers to exceed American Association of State Highway and Transportation Officials (AASHTO) LRFD design specifications for HS-20 live loads and deep burial earth loads
- Subjecting the chambers to rigorous full scale testing, under severe loading conditions to verify the AASHTO safety factors for live load and deep burial applications
- Designing chambers to conform to the product requirements of ASTM F2418 and ASTM F2922 and design requirements of ASTM F2787 ensuring both the assurance of product quality and safe structural design

Our chambers provide

- Large capacity that **fits very tight footprints** providing developers with more usable land for development
- A proven attenuation alternative to cumbersome large diameter metal pipe
- Provides the strength of concrete vaults at a very competitive price
- The **robust continuous true elliptical arch design**, which effectively transfers loads to the surrounding backfill providing the long-term safety factors required by AASHTO. Offers developers a cost-effective underground system that will perform as designed for decades.
- **Designed in accordance with the AASHTO LRFD Bridge Design Specifications** providing engineers with a structural performance standard for live and long-term dead loads
- **Polypropylene and polyethylene** resins tested using ASTM standards to ensure long and short-term structural properties
- **Injection molded** for uniform wall thickness and repeatable quality
- Third-party **tested and patented Isolator Row PLUS** for less frequent maintenance, water quality and long-term performance
- Incorporates **traditional manifold/header designs** using conventional hydraulic equations that can easily verify flow equalization and scour velocity
- **Open chamber design** requiring only one chamber model to construct each row assuring ease of construction and no repeating end walls to obstruct access or flow.

StormTech offers a variety of chamber sizes (**SC-160LP, SC-310, SC-740, DC-780, SC-800, MC-3500, MC-4500 and MC-7200**) so the consulting design engineer can choose the chamber that is best suited for the site conditions and regulatory requirements. StormTech has thousands of chamber systems in service worldwide. We provide plan layout and cost estimate services at no charge for consulting engineers and developers.

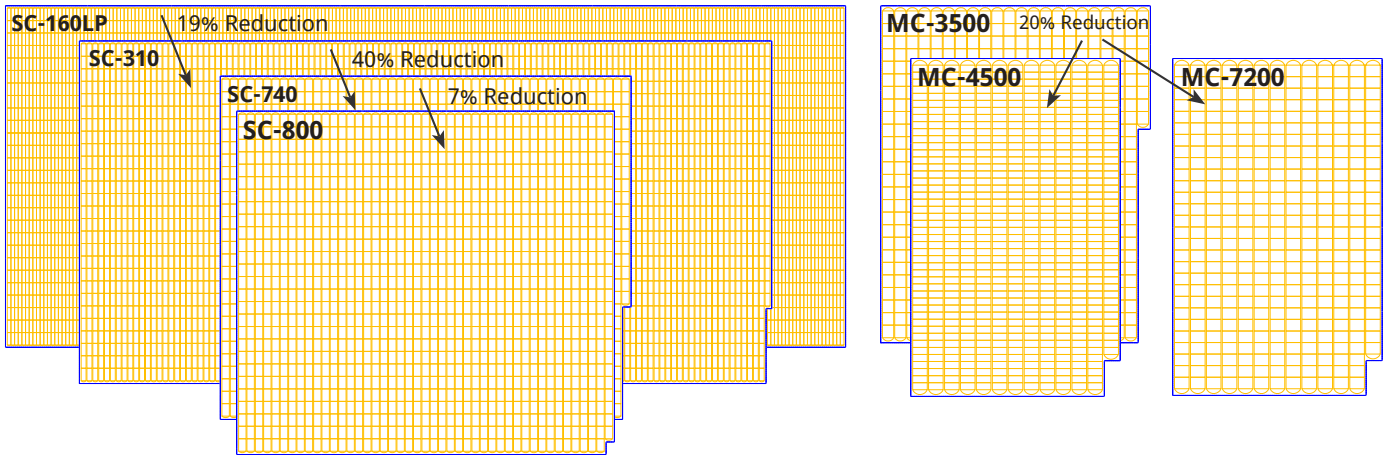
Stormtech Subsurface Stormwater Management



MC-7200 MC-4500 MC-3500 SC-800 DC-780 SC-740 SC-310 SC-160LP

Product Specifications	MC-7200	MC-4500	MC-3500	SC-800	DC-780	SC-740	SC-310	SC-160LP
Height, in. (mm)	60 (1524)	60 (1524)	45 (1143)	33 (838)	30 (762)	30 (762)	16 (406)	12 (305)
Width, in. (mm)	100 (2540)	100 (2540)	77 (1956)	51 (1295)	51 (1295)	51 (1295)	34 (864)	25 (635)
Length, in. (mm)	83.4 (2120)	52.0 (1321)	90.0 (2286)	90.6 (2301)	90.7 (2304)	90.7 (2304)	90.7 (2304)	90.7 (2304)
Installed length, in. (mm)	79.1 (2010)	48.3 (1227)	86.0 (2184)	85.4 (2169)	85.4 (2169)	85.4 (2169)	85.4 (2169)	85.4 (2169)
Bare Chamber Storage, cf (cm)	175.9 (4.98)	106.5 (3.01)	109.9 (3.11)	50.6 (1.43)	46.2 (1.3)	45.9 (1.3)	14.7 (0.42)	6.85 (0.19)
Stone above, in. (mm)	12 (305)	12 (305)	12 (305)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)
Minimum stone below, in. (mm)	9 (229)	9 (229)	9 (229)	6 (152)	9 (229)	6 (152)	6 (152)	4 (102)
Row spacing, in. (mm)	9 (229)	9 (229)	6 (152)	6 (152)	6 (152)	6 (152)	3 (76)	N/A
Minimum installed storage, cf (cm)	267.3 (7.56)	162.6 (4.60)	175 (4.96)	81 (2.29)	78.4 (2.20)	74.9 (2.12)	29.3 (0.83)	14.9 (0.42)
Storage per unit area, cf/sf (cm/sm)	4.46 (1.35)	4.44 (1.35)	3.53 (1.07)	2.39 (0.72)	2.31 (0.70)	2.21 (0.67)	1.3 (0.39)	1 (0.30)
Max cover from ground, in. (mm)	84 (2133)	84 (2133)	96 (2438)	96 (2438)	144 (3657)	96 (2438)	96 (2438)	120 (3048)

Example: Footprint Comparison-100,000 CF Project

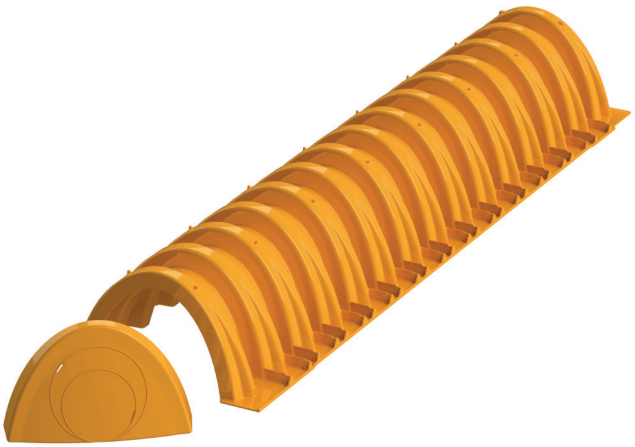


StormTech SC-160LP Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for commercial and municipal applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

The SC-160LP chamber was developed for infiltration and detention in shallow cover applications

- Only 14” (350 mm) required from top of chamber to bottom of pavement
- Only 12” (300 mm) tall
- Installs toe to toe—no additional spacing between rows

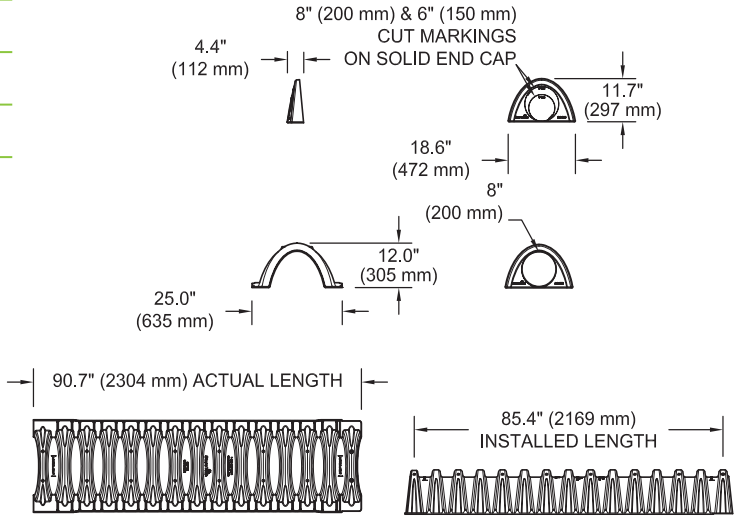


SC-160LP Chamber (not to scale)

Nominal Specifications

Size (LxWxH)	85.4” x 25.0” x 12.0” (2170 x 635 x 305 mm)
Chamber Storage	6.85 ft³ (0.19 m³)
Min. Installed Storage*	15.0 ft³ (0.42 m³)
Weight	24.0 lbs. (10.9 kg)

*Assumes 6 (150 mm) stone above, 4 (100 mm) below and stone between chambers with 40% stone porosity

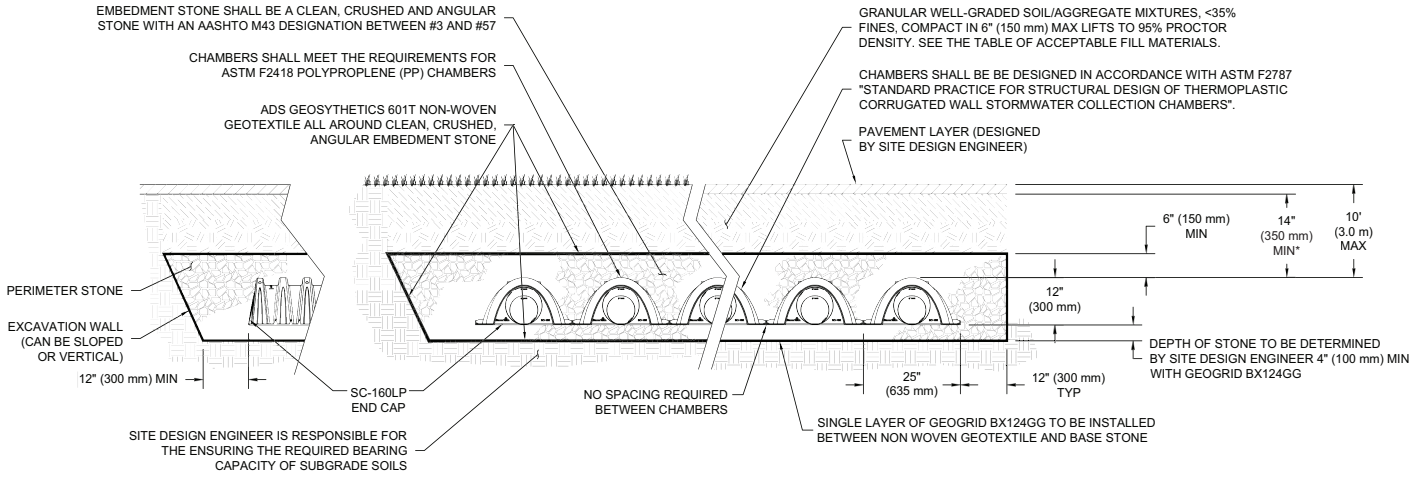


Shipping

132 chambers/pallet

144 end caps/pallet

12 pallets/truck



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 20" (510 mm).

The installed chamber system shall provide the load factors specified in the AASHTO LRFD Bridge Design Specifications section 12.12 for earth and live loads, with consideration for impact and multiple Vehicle presences.

SC-160LP Cumulative Storage Volumes per chamber
Assumes 40% Stone Porosity. Calculations are based upon a 4" (100 mm) Stone Base Under Chambers.

Depth of Water in System in. (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
22 (559)	6.85 (0.194)	14.98 (0.424)
21 (533)	6.85 (0.194)	14.49 (0.410)
20 (508)	6.85 (0.194)	14.00 (0.396)
19 (483)	6.85 (0.194)	13.50 (0.382)
18 (457)	6.85 (0.194)	13.01 (0.368)
17 (432)	6.85 (0.194)	12.51 (0.354)
16 (406)	6.85 (0.194)	12.02 (0.340)
15 (381)	6.80 (0.193)	11.49 (0.325)
14 (356)	6.67 (0.189)	10.92 (0.309)
13 (330)	6.38 (0.181)	10.25 (0.290)
12 (305)	5.94 (0.168)	9.49 (0.269)
11 (279)	5.40 (0.153)	8.67 (0.246)
10 (254)	4.78 (0.135)	7.81 (0.221)
9 (229)	4.10 (0.116)	6.91 (0.196)
8 (203)	3.36 (0.095)	5.97 (0.169)
7 (178)	2.58 (0.073)	5.01 (0.142)
6 (152)	1.76 (0.050)	4.02 (0.114)
5 (127)	0.89 (0.025)	3.01 (0.085)
4 (102)	0 (0)	1.98 (0.056)
3 (76)	0 (0)	1.48 (0.042)
2 (51)	0 (0)	0.99 (0.028)
1 (25)	0 (0)	0.49 (0.014)

Stone Cover

Stone Foundation

Note: Add 0.49 ft³ (0.014 m³) of storage for each additional inch (25 mm) of stone foundation.

Amount of Stone Per Chamber

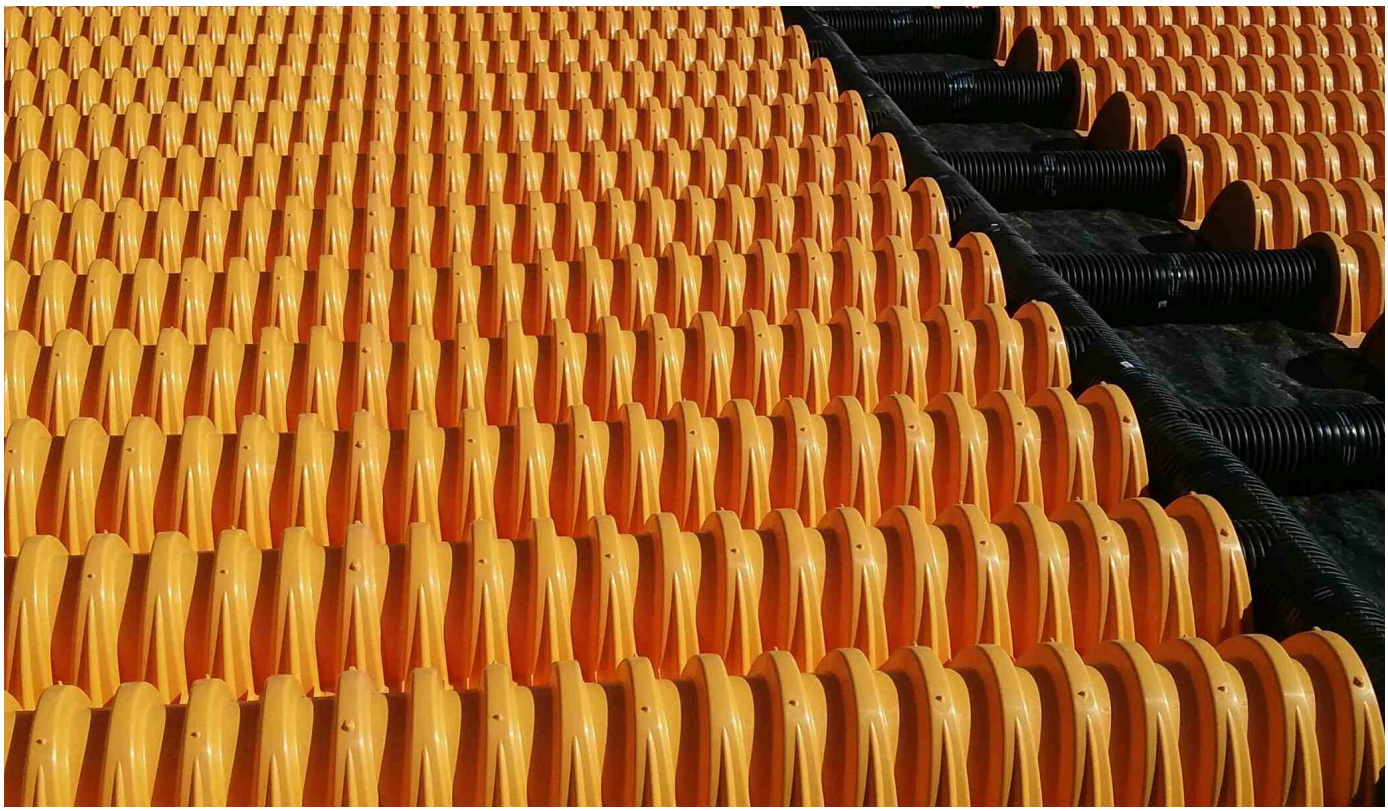
TONS (yds³)	Stone Foundation Depth		
	4	6	8
SC-160LP	1.1 (0.8)	1.2 (0.9)	1.3 (0.9)
KILOGRAMS (m³)	**100 mm**	**150 mm**	**200 mm**
SC-160LP	952 (0.7)	1,074 (0.8)	1,197 (0.8)

Note: Assumes 6 (150 mm) of stone above and only embedment stone between chambers.

Volume Excavation Per Chamber yd³ (m³)

Yards³ (m³)	Stone Foundation Depth		
	4 (100)	8 (200)	12 (300)
SC-160LP	1.4 (1.1)	1.6 (1.2)	1.8 (1.3)

Note: Assumes no row separation and 14 (350 mm) of cover. The volume of excavation will vary as depth of cover increases.



StormTech SC-310 Chamber

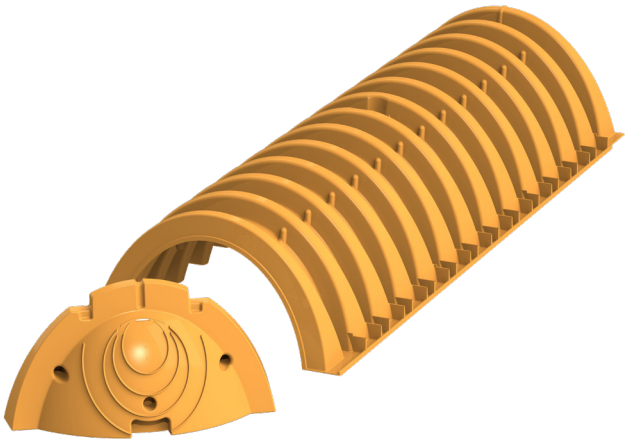
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

SC-310 Chamber (not to scale)

Nominal Specifications

Size (Lx W x H)	85.4” x 34.0” x 16.0” (2170 x 864 x 406 mm)
Chamber Storage	14.7ft^3 (0.42 m^3)
Min. Installed Storage*	29.3 ft^3 (0.83 m^3)
Weight	37.0 lbs (16.8 kg)

*Assumes 6 (150 mm) stone above and below chambers, 3 (76 mm) row spacing and 40% stone porosity.

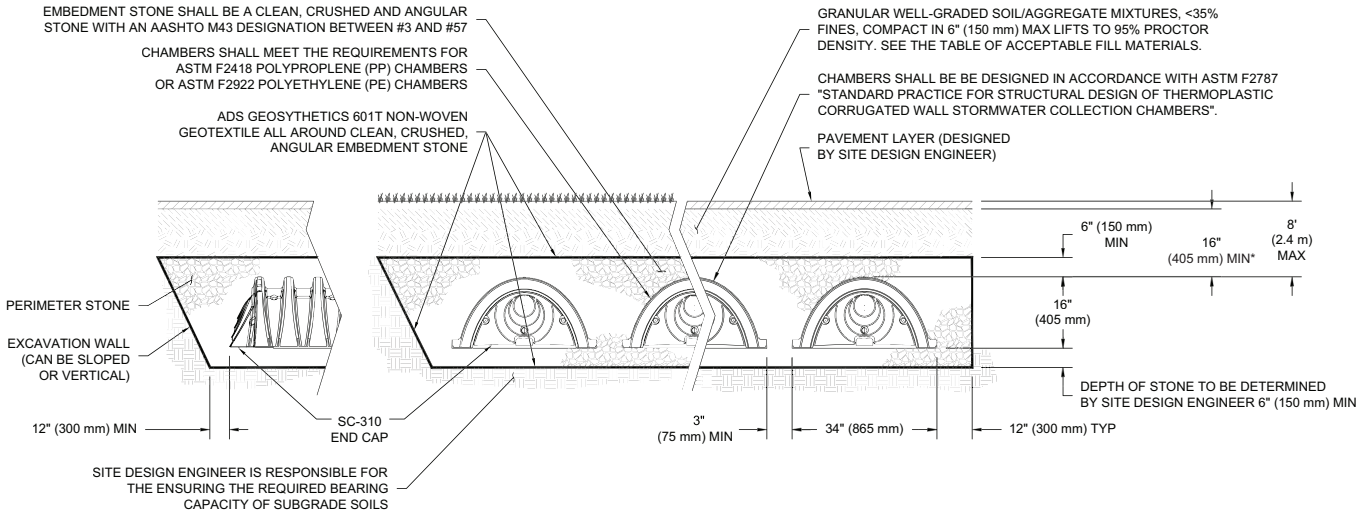


Shipping

55 chambers/pallet

108 end caps/pallet

18 pallets/truck



The installed chamber system shall provide the load factors specified in the AASHTO LRFD Bridge Design Specifications section 12.12 for earth and live loads, with consideration for impact and multiple vehicle presences.

SC-310 Cumulative Storage Volumes per chamber
Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System in. (mm)		Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)	Stone Cover	14.70 (0.416)	29.34 (0.831)
27 (686)		14.70 (0.416)	28.60 (0.810)
26 (660)		14.70 (0.416)	27.87 (0.789)
25 (635)		14.70 (0.416)	27.14 (0.769)
24 (610)		14.70 (0.416)	26.41 (0.748)
23 (584)		14.70 (0.416)	25.68 (0.727)
22 (559)		14.70 (0.416)	24.95 (0.707)
21 (533)		14.64 (0.415)	24.18 (0.685)
20 (508)		14.49 (0.410)	23.36 (0.661)
19 (483)		14.22 (0.403)	22.47 (0.636)
18 (457)		13.68 (0.387)	21.41 (0.606)
17 (432)		12.99 (0.368)	20.25 (0.573)
16 (406)		12.17 (0.345)	19.03 (0.539)
15 (381)		11.25 (0.319)	17.74 (0.502)
14 (356)		10.23 (0.290)	16.40 (0.464)
13 (330)		9.15 (0.260)	15.01 (0.425)
12 (305)		7.99 (0.226)	13.59 (0.385)
11 (279)		6.78 (0.192)	12.13 (0.343)
10 (254)		5.51 (0.156)	10.63 (0.301)
9 (229)		4.19 (0.119)	9.11 (0.258)
8 (203)		2.83 (0.080)	7.56 (0.214)
7 (178)		1.43 (0.041)	5.98 (0.169)
6 (152)	Stone Foundation	0 (0)	4.39 (0.124)
5 (127)		0 (0)	3.66 (0.104)
4 (102)		0 (0)	2.93 (0.083)
3 (76)		0 (0)	2.19 (0.062)
2 (51)		0 (0)	1.46 (0.041)
1 (25)		0 (0)	0.73 (0.021)

Note: Add 0.73 ft³ (0.021 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber

ft³ (m³)	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-310	14.7 (0.42)	29.3 (0.83)	33.7 (0.95)	38.1 (1.08)

Note: Assumes 6" (150 mm) of stone above chambers, 3" (76 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

TONS (yds³)	Stone Foundation Depth		
	6	12	18
SC-310	1.9 (1.4)	2.5 (1.8)	3.1 (2.2)
KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
SC-310	1,724 (1.0)	2,268 (1.3)	2,812 (1.7)

Note: Assumes 6" (150 mm) of stone above and and 3" (76 mm) row spacing.

Volume Excavation Per Chamber

yd³ (m³)	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-310	2.6 (2.0)	3.0 (2.3)	3.4 (2.6)

Note: Assumes 3" (76 mm) of row separation and 6" (150 mm) of stone above the chambers and 16" (400 mm) of cover. The volume of excavation will vary as depth of cover increases



StormTech SC-740 Chamber

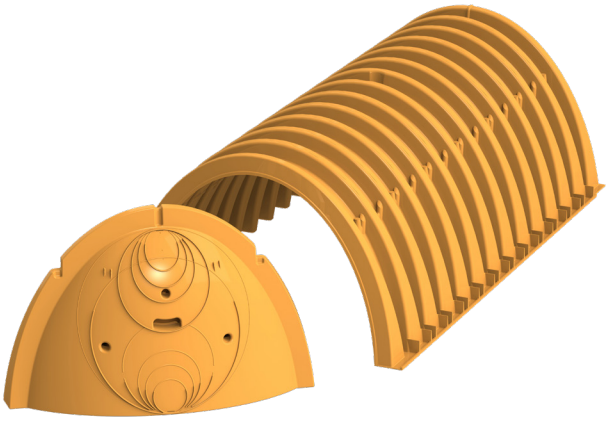
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

StormTech SC-740 Chamber (not to scale)

Nominal Specifications

Size (Lx W x H)	85.4” x 51.0” x 30.0” (2169 x 1295 x 762 mm)
Chamber Storage	45.9 ft³ (1.30 m³)
Min. Installed Storage*	74.9 ft³ (2.12 m³)
Weight	74.0 lbs (33.6 kg)

*Assumes 6” (150 mm) stone above, below and between chambers and 40% stone porosity.

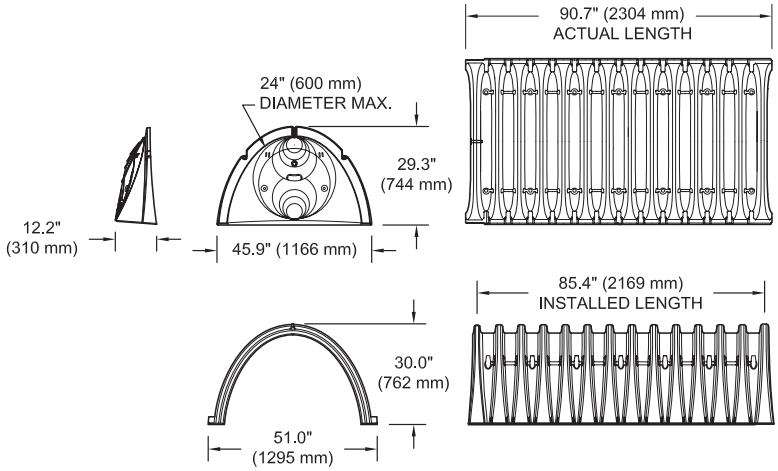


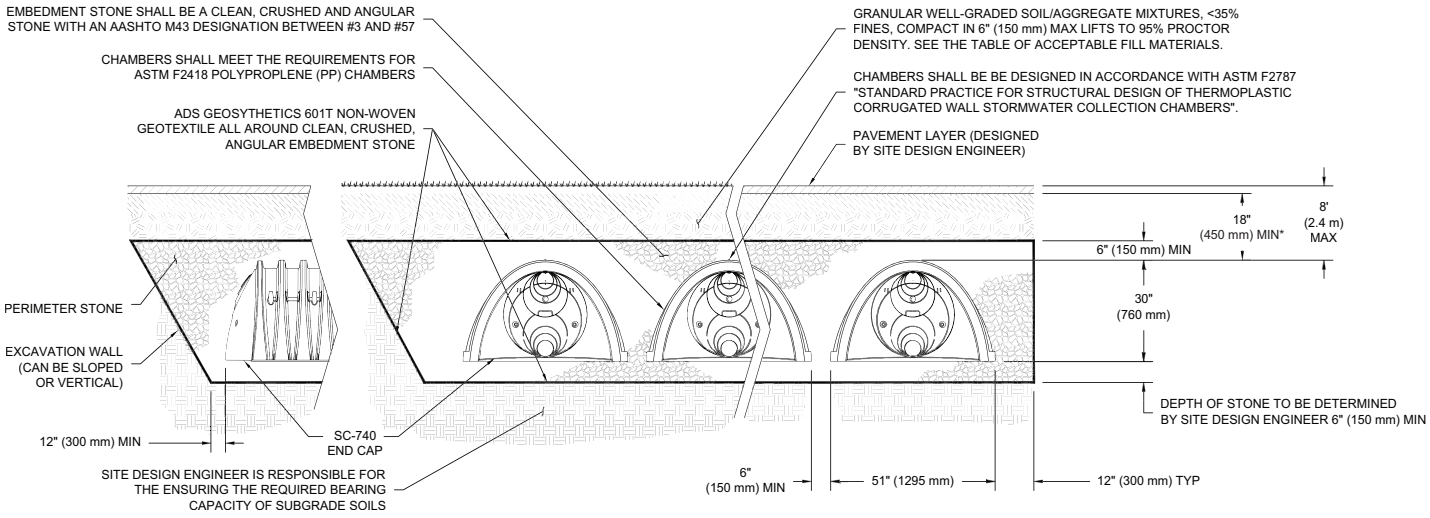
Shipping

30 chambers/pallet

60 end caps/pallet

12 pallets/truck





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

The installed chamber system shall provide the load factors specified in the AASHTO LRFD Bridge Design Specifications section 12.12 for earth and live loads, with consideration for impact and multiple vehicle presences.

SC-740 Cumulative Storage Volumes per chamber
Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System in. (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)	45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	45.90 (1.300)	72.64 (2.057)
39 (991)	45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (940)	45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	w61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	1.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	0 (0)	6.76 (0.191)
5 (127)	0 (0)	5.63 (0.160)
4 (102)	0 (0)	4.51 (0.128)
3 (76)	0 (0)	3.38 (0.096)
2 (51)	0 (0)	2.25 (0.064)
1 (25)	0 (0)	1.13 (0.032)

Stone Cover

Stone Foundation

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber

ft³ (m³)	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

TONS (yds³)	Stone Foundation Depth		
	6	12	16
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6" (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber

yd³ (m³)	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

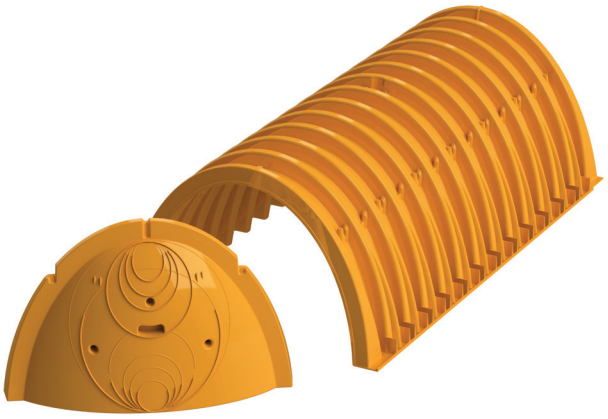
Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.



StormTech DC-780 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

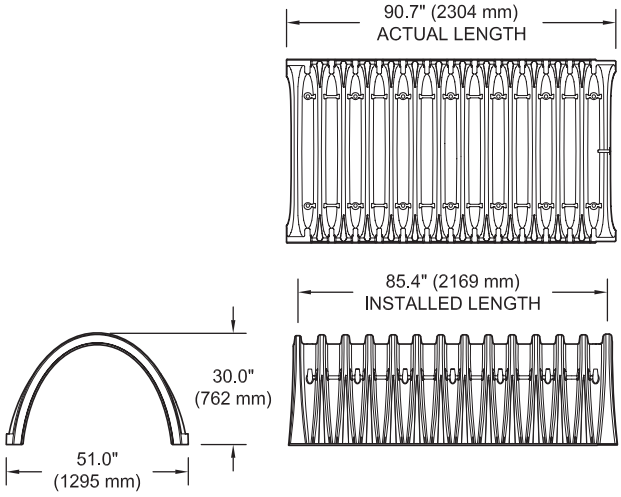
- 12’ (3.6 m) Deep Cover Applications
- Designed in accordance with ASTM F2787 and produced to meet the ASTM 2418 product standard.
- AASHTO safety factors provided for AASHTO Design Truck (H20 and deep cover conditions.)



DC-780 Chamber (not to scale)
Nominal Specifications

Size (Lx W x H)	85.4” x 51.0” x 30.0” (2169 x 1295 x 762 mm)
Chamber Storage	46.2 ft³ (1.30 m³)
Min. Installed Storage*	78.4 ft³ (2.2 m³)

*Assumes 9 (230 mm) stone below, 6 (150 mm) stone above, 6 (150 mm) row spacing and 40% stone porosity.

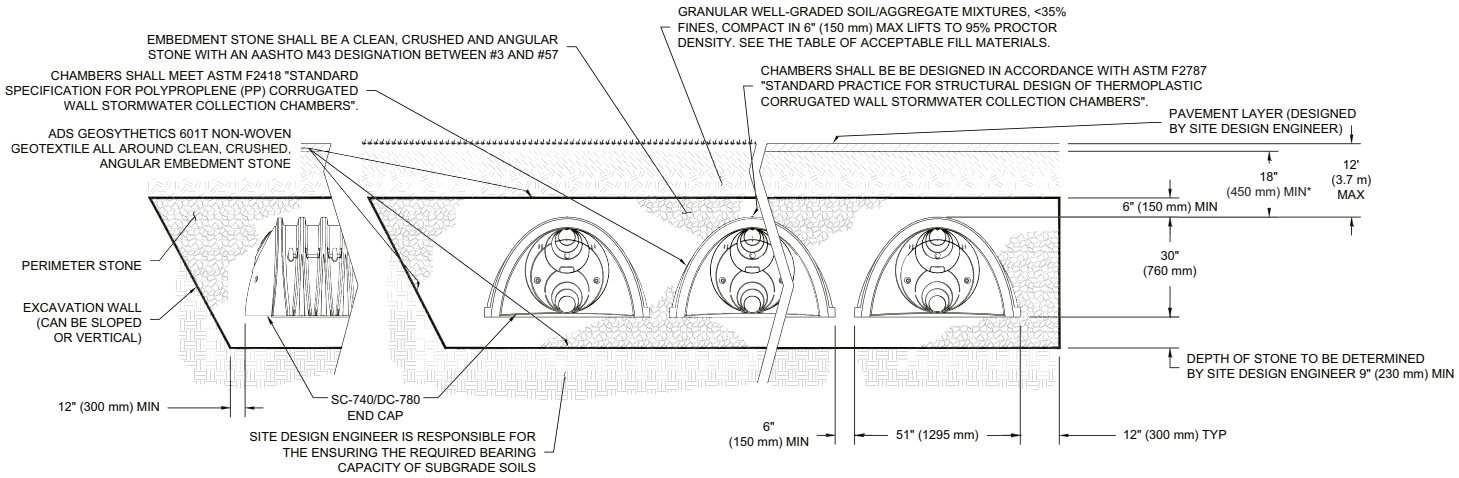


Shipping

25 chambers/pallet

60 end caps/pallet

12 pallets/truck



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

The installed chamber system shall provide the load factors specified in the AASHTO LRFD Bridge Design Specifications section 12.12 for earth and live loads, with consideration for impact and multiple vehicle presences.

DC-780 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 9" (230 mm) Stone Base Under Chambers.

Depth of Water in System in. (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
45 (1,143)	46.27 (1.310)	78.47 (2.222)
44 (1,118)	46.27 (1.310)	77.34 (2.190)
43 (1,092)	46.27 (1.310)	76.21 (2.158)
42 (1,067)	46.27 (1.310)	75.09 (2.126)
41 (1,041)	46.27 (1.310)	73.96 (2.094)
40 (1,016)	46.27 (1.310)	72.83 (2.062)
39 (991)	46.27 (1.310)	71.71 (2.030)
38 (965)	46.21 (1.309)	70.54 (1.998)
37 (940)	46.04 (1.304)	69.32 (1.963)
36 (914)	45.76 (1.296)	68.02 (1.926)
35 (889)	45.15 (1.278)	66.53 (1.884)
34 (864)	44.34 (1.255)	64.91 (1.838)
33 (838)	43.38 (1.228)	63.21 (1.790)
32 (813)	42.29 (1.198)	61.43 (1.740)
31 (787)	41.11 (1.164)	59.59 (1.688)
30 (762)	39.83 (1.128)	57.70 (1.634)
29 (737)	38.47 (1.089)	55.76 (1.579)
28 (711)	37.01 (1.048)	53.76 (1.522)
27 (686)	35.49 (1.005)	51.72 (1.464)
26 (660)	33.90 (0.960)	49.63 (1.405)
25 (635)	32.24 (0.913)	47.52 (1.346)
24 (610)	30.54 (0.865)	45.36 (1.285)
23 (584)	28.77 (0.815)	43.18 (1.223)
22 (559)	26.96 (0.763)	40.97 (1.160)
21 (533)	25.10 (0.711)	38.72 (1.096)
20 (508)	23.19 (0.657)	36.45 (1.032)
19 (483)	21.25 (0.602)	34.16 (0.967)
18 (457)	19.26 (0.545)	31.84 (0.902)
17 (432)	17.24 (0.488)	29.50 (0.835)
16 (406)	15.19 (0.430)	27.14 (0.769)
15 (381)	13.10 (0.371)	24.76 (0.701)
14 (356)	10.98 (0.311)	22.36 (0.633)
13 (330)	8.83 (0.250)	19.95 (0.565)
12 (305)	6.66 (0.189)	17.52 (0.496)
11 (279)	4.46 (0.126)	15.07 (0.427)
10 (254)	2.24 (0.064)	12.61 (0.357)
9 (229)	0 (0)	10.14 (0.287)
8 (203)	0 (0)	9.01 (0.255)
7 (178)	0 (0)	7.89 (0.223)
6 (152)	0 (0)	6.76 (0.191)
5 (127)	0 (0)	5.63 (0.160)
4 (102)	0 (0)	4.51 (0.128)
3 (76)	0 (0)	3.38 (0.096)
2 (51)	0 (0)	2.25 (0.064)
1 (25)	0 (0)	1.13 (0.032)

Stone Cover

Stone Foundation

Note: Add 1.13 ft³ (0.032 m³) of Storage for Each Additional Inch (25 mm) of Stone Foundation.

Storage Volume Per Chamber

ft³ (m³)	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		9 (230)	12 (300)	18 (450)
DC-780	46.2 (1.3)	78.4 (2.2)	81.8 (2.3)	88.6 (2.5)

Note: Assumes 40% porosity for the stone, the bare chamber volume, 6" (150 mm) of stone above, and 6" (150 mm) row spacing.

Amount of Stone Per Chamber

TONS (yds³)	Stone Foundation Depth		
	9"	12"	18"
DC-780	4.2 (3.0)	4.7 (3.3)	5.6 (3.9)
KILOGRAMS (m³)	**230 mm**	**300 mm**	**450 mm**
DC-780	3,810 (2.3)	4,264 (2.5)	5,080 (3.0)

Note: Assumes 9 (150 mm) of stone above, and between chambers.

Volume Excavation Per Chamber

yd³ (m³)	Stone Foundation Depth in. (mm)		
	9 (230)	12 (300)	18 (450)
DC-780	5.9 (4.5)	6.3 (4.8)	6.9 (5.3)

Note: Assumes 6" (150 mm) separation between chamber rows and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.



StormTech SC-800 Chamber

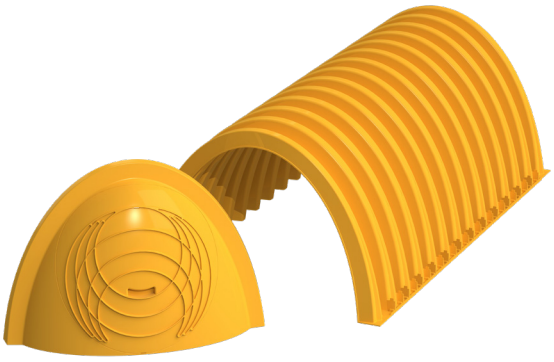
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

StormTech SC-800 Chamber (not to scale)

Nominal Specifications

Size (Lx W x H)	85.4” x 51” x 33” (2169 x 1295 x 838 mm)
Chamber Storage	50.6 ft³ (1.43 m³)
Min. Installed Storage*	81.0 ft³ (2.29 m³)
Weight	81.8 lbs (37.1 kg)

*Assumes 6” (150 mm) stone above, below and between chambers and 40% stone porosity.

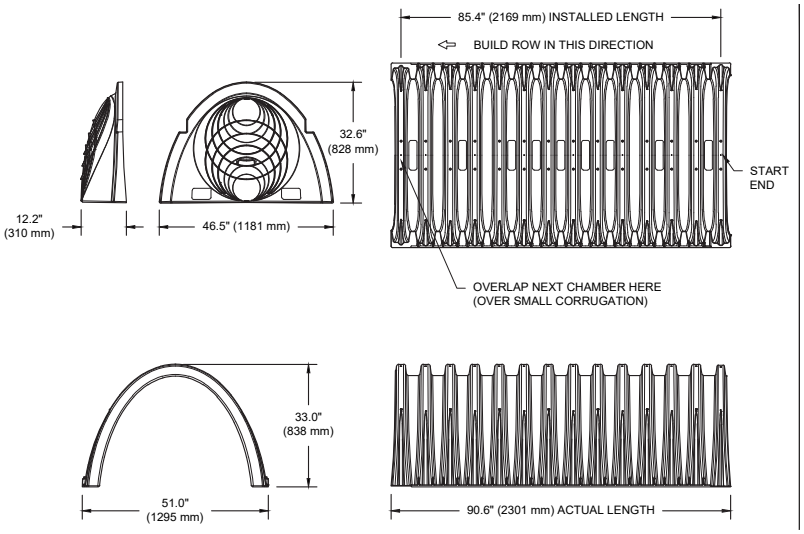


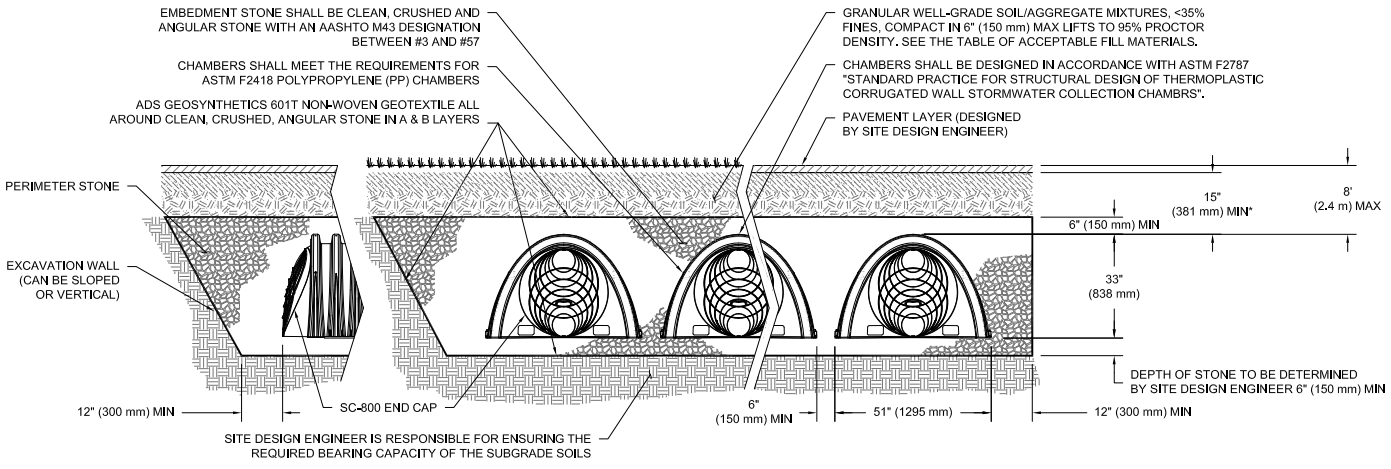
Shipping

30 chambers/pallet

60 end caps/pallet

12 pallets/truck





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 21" (533 mm).

The installed chamber system shall provide the load factors specified in the AASHTO LRFD Bridge Design Specifications section 12.12 for earth and live loads, with consideration for impact and multiple vehicle presences.

Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6” (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
45 (1143)	50.62 (1.433)	81.08 (2.296)
44 (1118)	50.62 (1.433)	79.96 (2.264)
43 (1092)	50.62 (1.433)	78.83 (2.232)
42 (1067)	50.62 (1.433)	77.70 (2.200)
41 (1041)	50.62 (1.433)	76.57 (2.168)
40 (1016)	50.62 (1.433)	75.44 (2.136)
39 (991)	50.62 (1.433)	74.31 (2.104)
38 (965)	50.55 (1.431)	73.14 (2.071)
37 (940)	50.35 (1.426)	71.90 (2.036)
36 (914)	50.07 (1.418)	70.60 (1.999)
35 (889)	49.56 (1.403)	69.17 (1.959)
34 (864)	48.82 (1.382)	67.60 (1.914)
33 (838)	47.93 (1.357)	65.94 (1.867)
32 (813)	46.91 (1.328)	64.20 (1.818)
31 (787)	45.79 (1.297)	62.40 (1.767)
30 (762)	44.58 (1.262)	60.55 (1.715)
29 (737)	43.28 (1.226)	58.65 (1.661)
28 (711)	41.91 (1.187)	56.70 (1.606)
27 (686)	40.47 (1.146)	54.71 (1.549)
26 (660)	38.96 (1.103)	52.68 (1.492)
25 (635)	37.40 (1.059)	50.61 (1.433)
24 (610)	35.78 (1.013)	48.51 (1.374)
23 (584)	34.10 (0.966)	46.38 (1.313)
22 (559)	32.38 (0.917)	44.22 (1.252)
21 (533)	30.61 (0.867)	42.03 (1.190)
20 (508)	28.80 (0.816)	39.82 (1.128)
19 (483)	26.95 (0.763)	37.58 (1.064)
18 (457)	25.06 (0.710)	35.32 (1.000)
17 (432)	23.13 (0.655)	33.04 (0.936)
16 (406)	21.17 (0.599)	30.74 (0.870)
15 (381)	19.17 (0.543)	28.42 (0.805)
14 (356)	17.14 (0.485)	26.08 (0.739)
13 (330)	15.09 (0.427)	23.72 (0.672)
12 (305)	13.00 (0.368)	21.34 (0.604)
11 (279)	10.89 (0.308)	18.95 (0.537)
10 (254)	8.76 (0.248)	16.54 (0.468)
9 (229)	6.60 (0.187)	14.12 (0.400)
8 (203)	4.42 (0.125)	11.69 (0.331)
7 (178)	2.22 (0.063)	9.24 (0.262)
6 (152)	0 (0)	6.78 (0.192)
5 (127)	0 (0)	5.65 (0.160)
4 (102)	0 (0)	4.52 (0.128)
3 (76)	0 (0)	3.39 (0.096)
2 (51)	0 (0)	2.26 (0.064)
1 (25)	0 (0)	1.13 (0.032)

Stone Cover

Stone Foundation

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-800 Chamber	50.6 (1.43)	81.0 (2.29)	87.8 (2.48)	94.6 (2.6)

Note: Assumes 6” (150 mm) stone above chambers, 6” (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth		
	6”	12”	18”
SC-800	3.9 (2.8)	4.8 (3.4)	5.7 (4.1)
Metric Kilograms (m³)	**150 mm**	**300 mm**	**450 mm**
SC-800	3580 (2.2)	4380 (2.6)	5170 (3.1)

Note: Assumes 6” (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6” (150 mm)	12” (300 mm)	18” (450 mm)
SC-800	5.6 (4.3)	6.3 (4.8)	6.9 (5.3)

Note: Assumes 6” (150 mm) of row separation and 15” (375 mm) of cover. The volume of excavation will vary as depth of cover increases.

StormTech MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

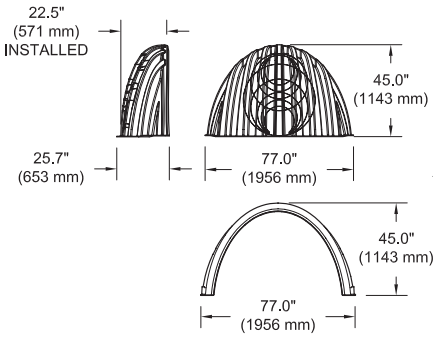
MC-3500 Chamber (not to scale)

Nominal Specifications

Size (LxWxH)	90” x 77” x 45” (2286 x 1956 x 1143 mm)
Chamber Storage	109.9 ft³ (3.11 m³)
Min. Installed Storage*	175.0 ft³ (4.96 m³)
Weight	134 lbs (60.8 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 6” (150 mm) of stone between chambers/end caps and 40% stone porosity.



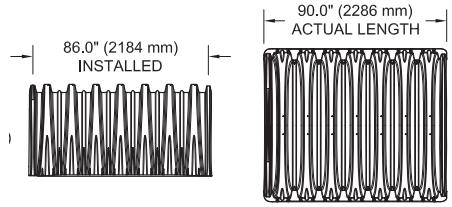


MC-3500 End Cap (not to scale)

Nominal Specifications

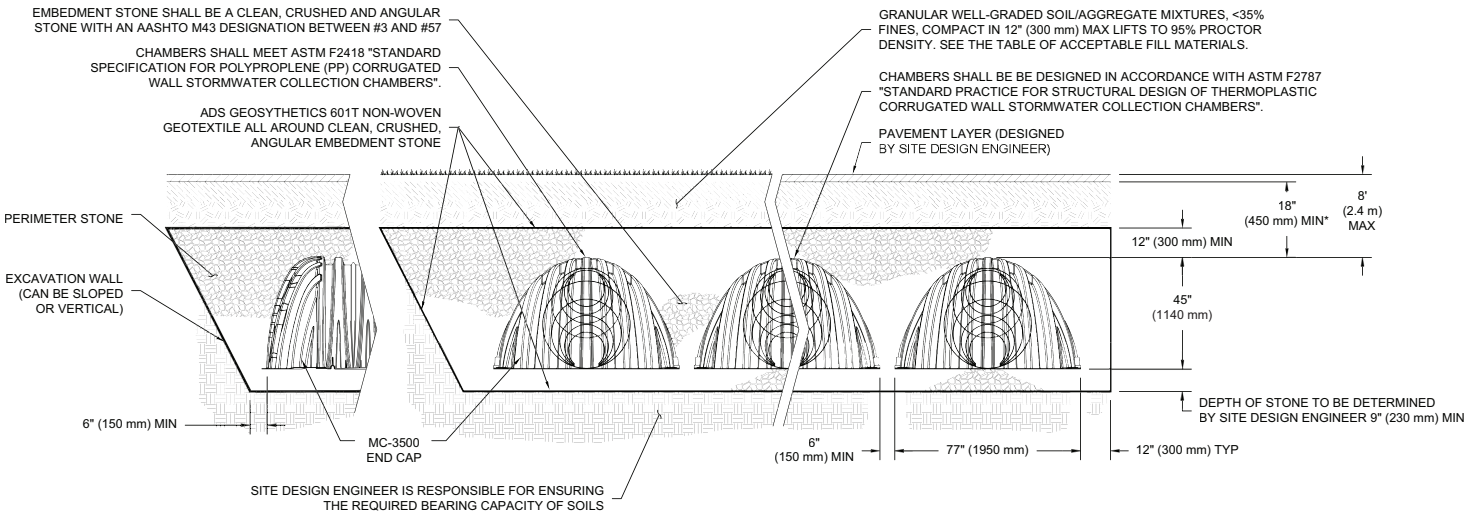
Size (LxWxH)	26.5” x 71” x 45.1” (673 x 1803 x 1145 mm)
End Cap Storage	14.9 ft³ (0.42 m³)
Min. Installed Storage*	45.1 ft³ (1.28 m³)
Weight	49 lbs (22.2 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 6” (150 mm) of stone perimeter, 6” (150 mm) of stone between chambers/end caps and 40% stone porosity.



Shipping

15 chambers/pallet
7 end caps/pallet
7 pallets/truck



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage ft³ (m³)	Chamber/End Cap and Stone Volume — Stone Foundation Depth in. (mm)			
		9 (230)	12 (300)	15 (375)	18 (450)
Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)	189.9 (5.38)
End Cap	14.9 (0.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)	49.9 (1.41)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

Amount of Stone Per Chamber

ENGLISH tons (yd³)	Stone Foundation Depth			
	9"	12"	15"	18"
Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
METRIC kg (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

Volume of Excavation Per Chamber/End Cap yd³ (m³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
Chamber	11.9 (9.1)	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)
End Cap	4.0 (3.1)	4.1 (3.2)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.



Special applications will be considered on a project by project basis. Please contact our application department should you have a unique application for our team to evaluate.



StormTech MC-4500 Chamber

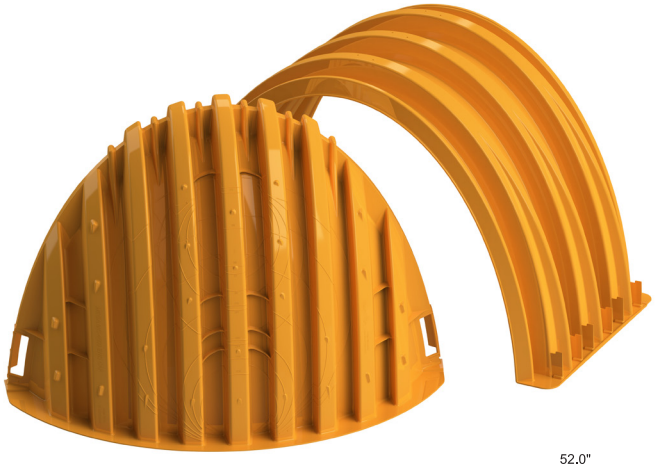
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

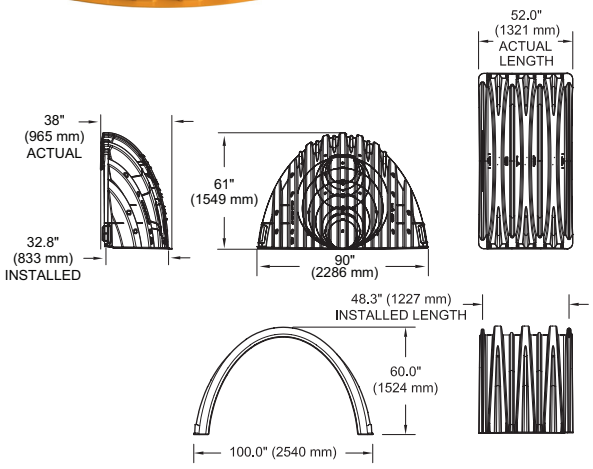
MC-4500 Chamber (not to scale)

Nominal Specifications

Size (LxWxH)	52” x 100” x 60” (1321 x 2540 x 1524 mm)
Chamber Storage	106.5 ft³ (3.01 m³)
Min. Installed Storage*	162.6 ft³ (4.60 m³)
Weight	125 lbs (56.7 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.





MC-4500 End Cap (not to scale)

Nominal Specifications

Size (LxWxH)	38” x 90” x 61” (965 x 2286 x 1549 mm)
End Cap Storage	39.5 ft³ (1.12 m³)
Min. Installed Storage*	115.3 ft³ (3.26 m³)
Weight	90.0 lbs (40.8 kg)

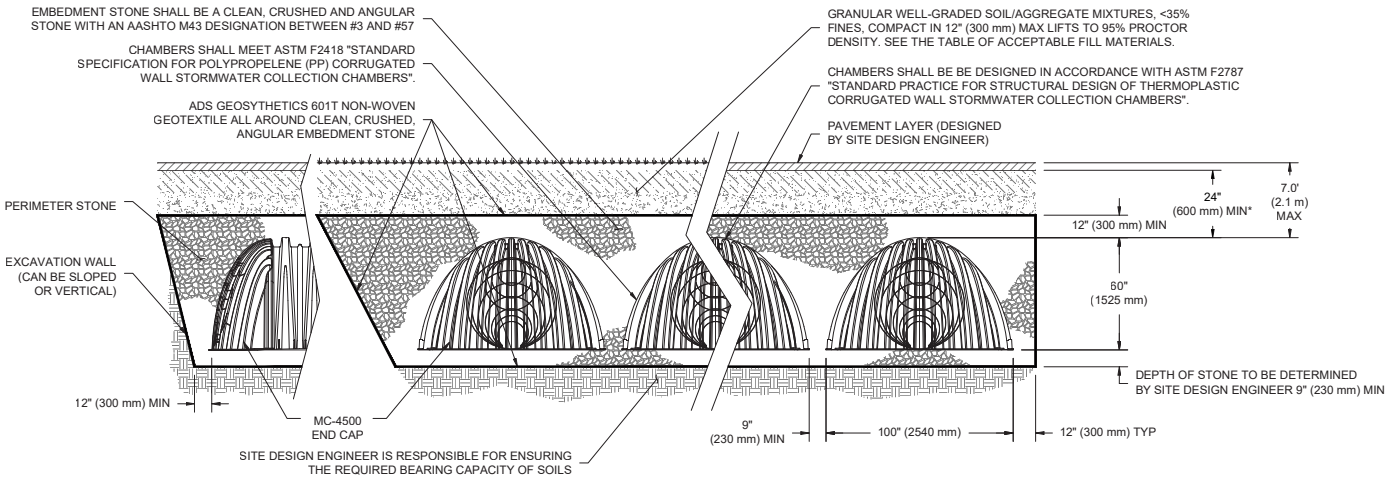
*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 12” (300 mm) of stone perimeter, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.

Shipping

7 chambers/pallet

5 end caps/pallet

11 pallets/truck



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage ft³ (m³)	Chamber/End Cap and Stone Volume — Stone Foundation Depth in. (mm)			
		9 (230)	12 (300)	15 (375)	18 (450)
Chamber	106.5 (3.02)	162.6 (4.60)	166.3 (4.71)	169.9 (4.71)	173.6 (4.91)
End Cap	39.5 (1.12)	115.3 (3.26)	111.9 (3.17)	121.9 (3.45)	125.2 (3.54)

Note: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter in front of end cap.

Amount of Stone Per Chamber

ENGLISH tons (yd³)	Stone Foundation Depth			
	9"	12"	15"	18"
Chamber	7.4 (5.2)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
End Cap	9.8 (7.0)	10.2 (7.3)	10.6 (7.6)	11.1 (7.9)
METRIC kg (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
Chamber	6713 (4.0)	7076 (4.2)	7529 (4.5)	7983 (4.7)
End Cap	8890 (5.3)	9253 (5.5)	9616 (5.8)	10069 (6.0)

Note: Assumes 12" (300 mm) of stone above and 9" (230 mm) row spacing and 12" (300 mm) of perimeter stone in front of end caps.

Volume of Excavation Per Chamber/End Cap yd³ (m³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
Chamber	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
End Cap	9.7 (7.4)	10.0 (7.6)	10.3 (7.9)	10.6 (8.1)

Note: Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of the end caps, and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.



Special applications will be considered on a project by project basis. Please contact our application department should you have a unique application for our team to evaluate.



StormTech MC-7200 Chamber

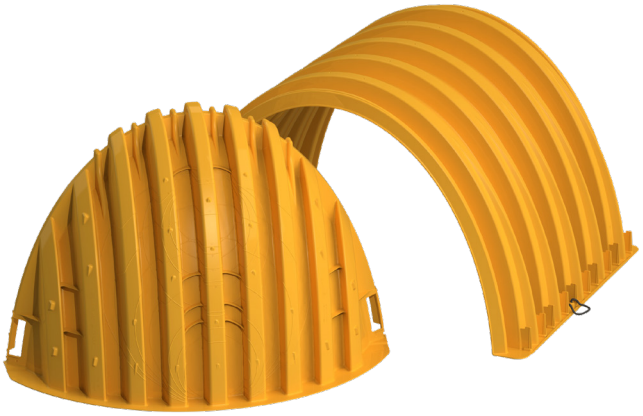
Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

MC-7200 Chamber (not to scale)

Nominal Specifications

Size (LxWxH)	83” x 100” x 60” (2108 x 2540 x 1524 mm)
Chamber Storage	175.9 ft³ (4.98 m³)
Min. Installed Storage*	267.3 ft³ (7.57 m³)
Weight	202 lbs (91.6 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.

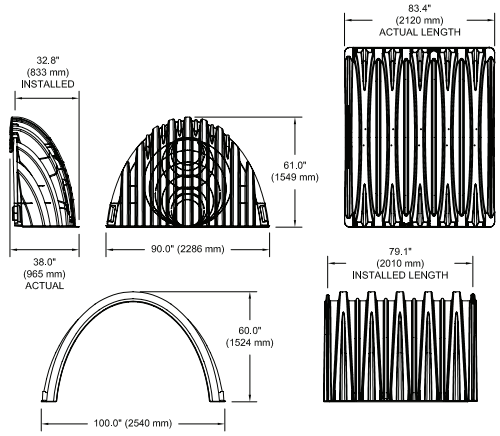


MC-7200 End Cap (not to scale)

Nominal Specifications

Size (LxWxH)	38” x 90” x 61” (965 x 2286 x 1549 mm)
End Cap Storage	39.5 ft³ (1.12 m³)
Min. Installed Storage*	115.3 ft³ (3.26 m³)
Weight	90.0 lbs (40.8 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 12” (300 mm) of stone perimeter, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.

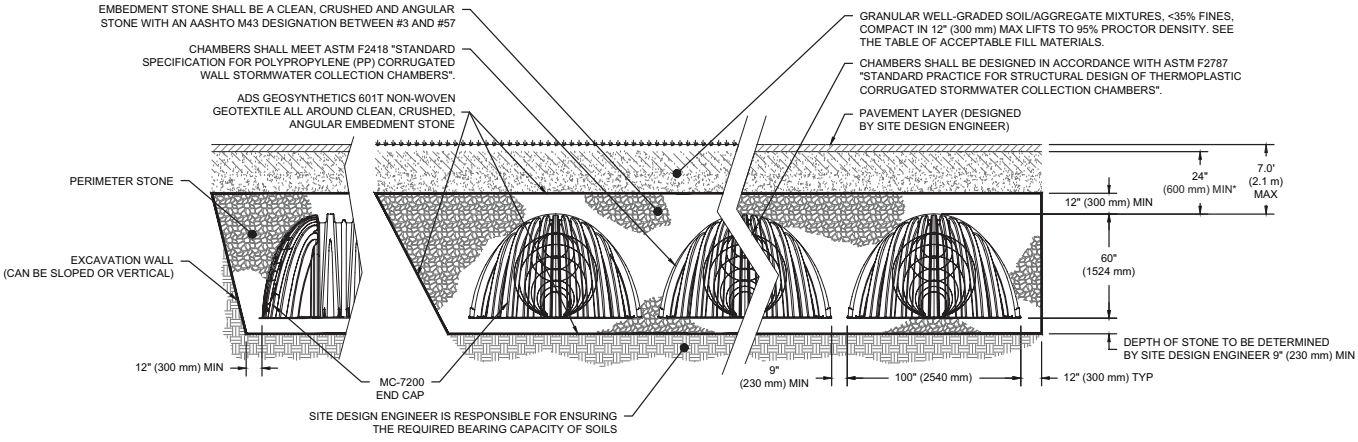


Shipping

7 chambers/pallet

5 end caps/pallet

6 pallets/truck



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

Storage Volume Per Chamber

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
Chamber	175.9 (4.98)	267.3 (7.57)	273.3 (7.74)	279.3 (7.91)	285.3 (8.08)
End Cap	39.5 (1.12)	115.3 (3.26)	118.6 (3.36)	121.9 (3.45)	125.2 (3.54)

Note: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter in front of end cap.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth			
	9"	12"	15"	18"
Chamber	12.1 (8.5)	12.9 (9.0)	13.6 (9.6)	14.3 (10.1)
End Cap	9.8 (7.0)	10.2 (7.3)	10.6 (7.6)	11.1 (7.9)
Metric Kilograms (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
Chamber	10977 (6.5)	11703 (6.9)	12338 (7.3)	12973 (7.7)
End Cap	8890 (5.3)	9253 (5.5)	9616 (5.8)	10069 (6.0)

Note: Assumes 12" (300 mm) of stone above and 9" (230 mm) row spacing and 12" (300 mm) of perimeter stone in front of end caps. 1 yd³ = 1.42 english tons.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375mm)	18 in (450 mm)
Chamber	17.2 (13.2)	17.7 (13.5)	18.3 (14.0)	18.8 (14.4)
End Cap	9.7 (7.4)	10.0 (7.6)	10.3 (7.9)	10.6 (8.1)

Note: Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of the end caps, and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.



StormTech Isolator Row® Plus

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, SC-800, MC-3500, MC-4500 or MC-7200 models, that has a continuous layer of ADS Plus fabric between the foundation stone and the chambers and is connected to a closely located manhole for easy access. The chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers allow stormwater to flow out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting.



The Isolator Row Plus is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row Plus FLAMP™ (patent pending) is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

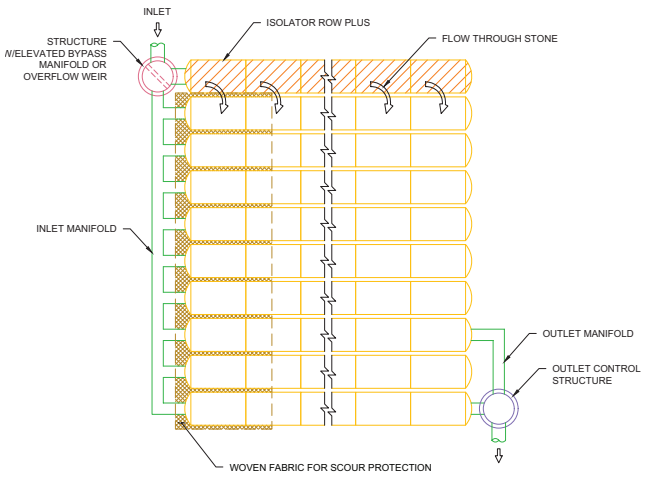
Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.*

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

StormTech Isolator Row Plus Schematic
(not to scale)



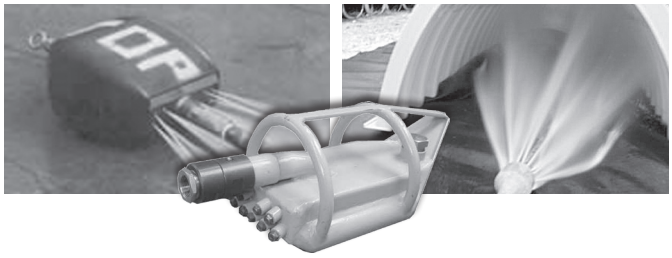
The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row Plus, clean-out should be performed.

Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.

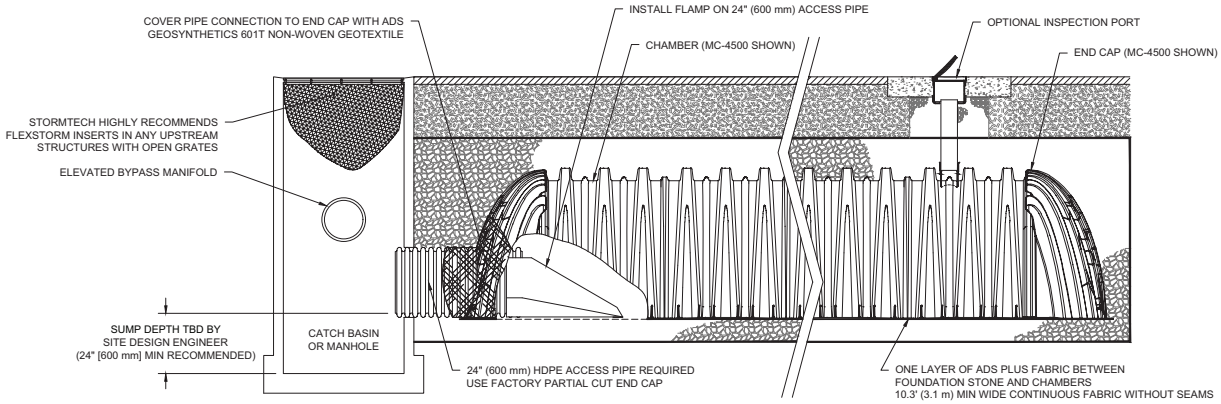


Examples of culvert cleaning nozzles appropriate for Isolator Row PLUS maintenance. (These are not StormTech products.)

A Flamp (fared end ramp) is attached to the inlet pipe on the inside of the chamber end cap to provide a smooth transition from pipe invert to fabric bottom. It is confgured to improve chamber function performance over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning, and to guide cleaning and inspection equipment back into the inlet pipe when complete.



Isolator Row Plus Detail



Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500, MC-4500 and MC-7200 chamber models and is not required over the entire Isolator Row PLUS.

StormTech Design Tool

Initial layouts and reports provide a visual understanding of various options and is the first step to choosing the design direction and evaluating potential cost.

Generate quick layouts

Import site plans & maps

Customize layouts

Save, manage, revise

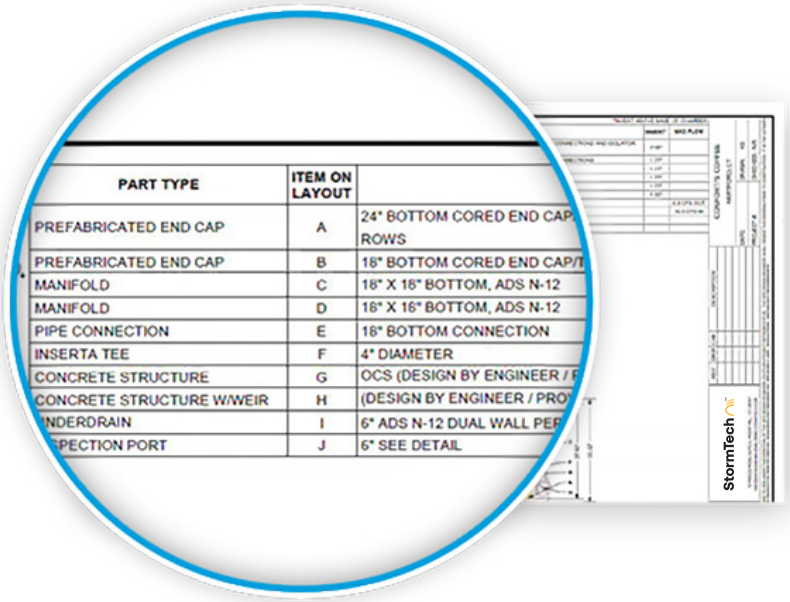
+2

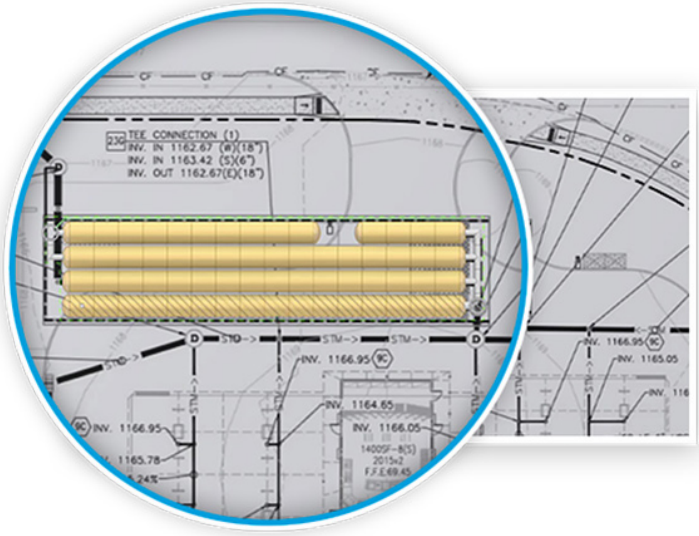
Multi-bed system design



Features

- Provides project data reports & plan layouts quickly
- The plans are produced in both PDF and CAD format
- Data provided in the detailed report is extensive enough to estimate installed cost
- Tool provides a design starting point that can be site customized by the ADS Technical Services team to fit site specific applications as directed by the Engineer
- An ADS team of inside and outside representatives are available to offer assistance
- ADS StormTech Design Tool can be viewed in several platforms, including tablets and smart phones





Benefits

- Helps designers in their evaluation efforts and response time
- Allows the engineer to customize layout by modifying the CAD layout, view a PDF version if needed, and to redline revisions to be sent to ADS Technical Services
- Allows the engineer to provide a detailed explanation of conceptual estimated installed system cost to clients
- Service is provided to designer at no cost and enables engineer to use internal resources for increased productivity
- Designer has a local and national resource for advice and follow-up as the design progresses
- Enables a designer or client to view and originate a project using the most convenient and readily available platform

ADS StormTech™

Working on a project?

Visit designtool.ads-pipe.com and utilize the enhanced StormTech Design Tool 2.0

StormTech SiteASSIST

The SiteASSIST by StormTech App enables ADS to take customer service and field support to unprecedented levels. With detailed instructions on proper installation techniques for StormTech chambers and supporting video animations, this tool is designed to insure installed performance. The animations can be played individually, or played together to provide a visual representation of a StormTech chamber system install from excavation to final backfill.

For sections that are frequently referred to, they can be saved to your favorites section for easy reference. SiteAssist is available in both English and Spanish.

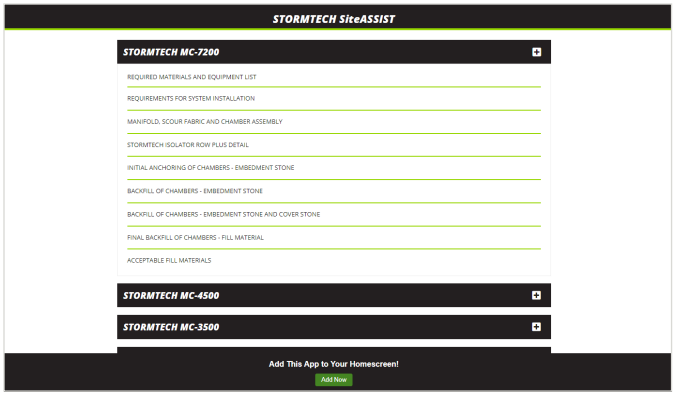


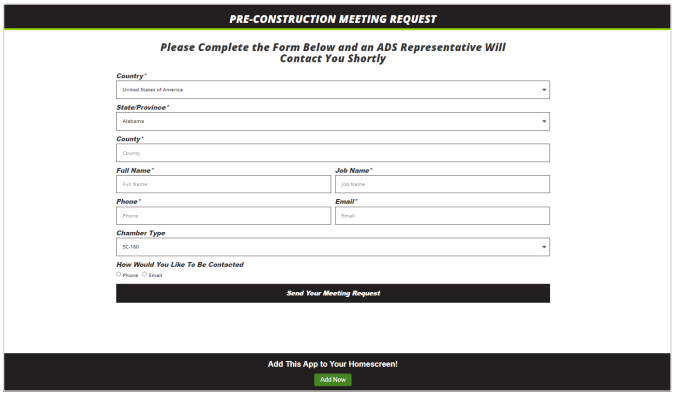
Submit questions with specific jobsite pictures

Utilize geo location services to notify the appropriate ADS team members

Response within an hour from StormTech support

Schedule a pre-construction meeting





ads-pipe-app.com/StormTechSiteASSIST

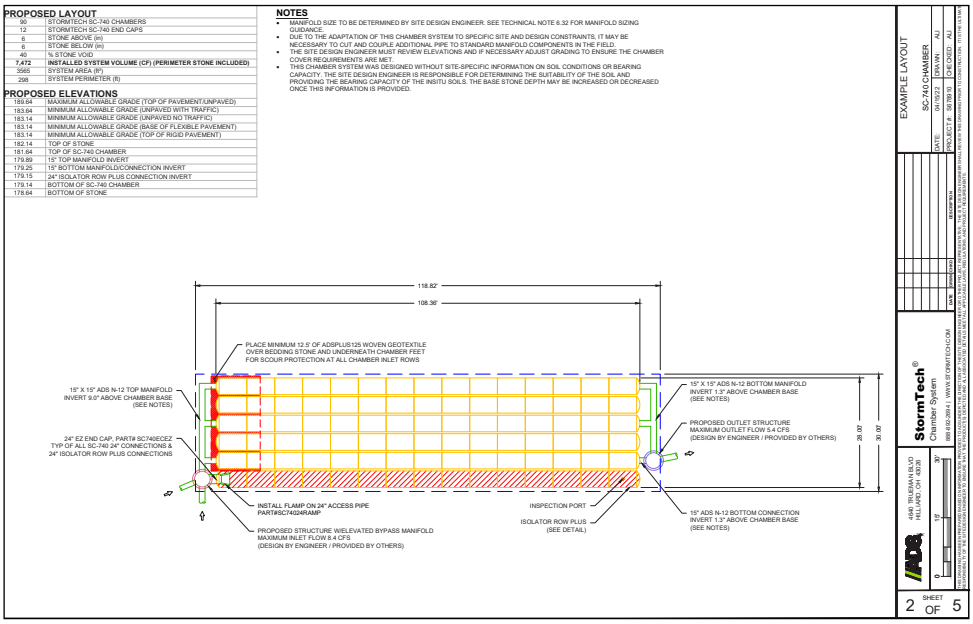
A Family of Products and Services

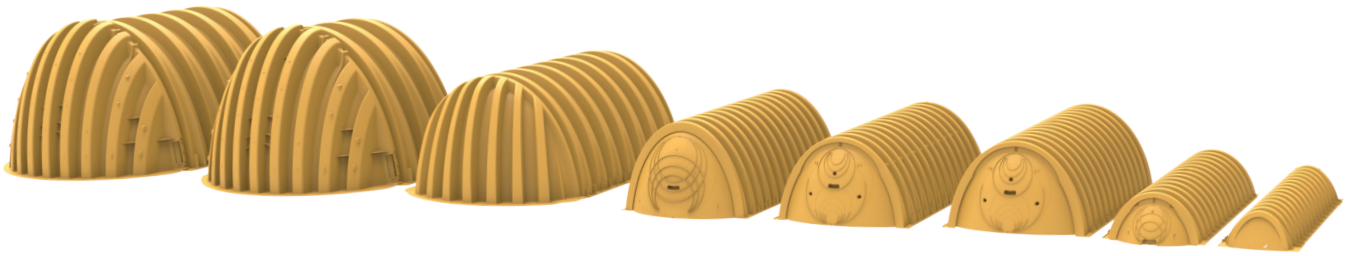
- MC-7200 Chambers and End Caps
- MC-4500 Chambers and End Caps
- MC-3500 Chambers and End Caps
- SC-800 Chambers and End Caps
- SC-310 Chambers and End Caps
- DC-780 Chambers and End Caps
- SC-740 Chambers and End Caps
- SC-160LP Chambers and End Caps
- SC, DC and MC Fabricated End Caps
- Fabricated Manifold Fittings
- Patented Isolator Row Plus for Maintenance and Water Quality
- Inserta Tee® Connections
- Nyloplast® Basins and Inline Drains
- Inlet Filters
- In-House System Layout Assistance
- On-Site Educational Seminars
- Worldwide Technical Sales Group
- Centralized Product Applications Department
- Research and Development Team
- Technical Literature, O&M Manuals and Detailed CAD drawings all downloadable via our Web Site
- StormTech Design Tool



StormTech provides state-of-the-art products and services that meet or exceed industry performance standards and expectations. We offer designers, regulators, owners and contractors the highest quality products and services for stormwater management that saves valuable land and protects water resources."

Please contact one of our inside Technical Service professionals or Engineered Product Managers (EPMs) to discuss your particular application. A wide variety of technical support material is available from our website at **adspipe.com**.
For any questions, please call StormTech at **888-892-2694**.





MC-7200 MC-4500 MC-3500 SC-800 DC-780 SC-740 SC-310 SC-160LP

Save Valuable Land and Protect Water Resources

This catalog is not intended to provide requirements for design or installation of StormTech chambers. Refer to the appropriate “StormTech Design Manual” and “StormTech Construction Guide” for design and installation specifications.

adspipe.com
800-821-6710

ADS “Terms and Conditions of Sale” are available on the ADS website, www.ads-pipe.com
Advanced Drainage Systems, the ADS logo and the Green Stripe are registered trademarks of Advanced Drainage Systems, Inc. StormTech® and the Isolator® Row PLUS are a registered trademarks of StormTech, Inc. LEED® and the Green Building Council Member logo are registered trademarks of the U.S. Green Building Council.
© 2025 Advanced Drainage Systems, Inc. #10818 1/25 CS

8.0 General Requirements

- Completion of this attachment is required for all PDPs subject to hydromodification management requirements (see PDP SWQMP Form Table 5). Do not submit this attachment if exempt from Hydromodification Management requirements. Document the PDP exemption in Attachment 9.
- Submit this cover page and all required Sub-attachments for all structural hydromodification management BMPs proposed for the project.
- Constructed features must fully satisfy the requirements described in applicable BMPDM sections and appendices, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.
- Structural BMP Certification. All structural hydromodification management BMPs documented this attachment must be certified by a registered engineer in Attachment 7, Sub-attachment 7.1.
- Structural BMP Verification. BMP installation must be verified by the County at the completion of construction. Applicants must complete an Installation Verification Form (Attachment 10).

Sub-attachments (check all that are completed)
☒ **8.1: Flow Control Facility Design** (required)[1] Submit using ☐ the Sub-attachment 8.1 cover sheet provided, or ☐ as a separate stand-alone document labeled Sub-attachment 8.1.
☒ **8.2: Hydromodification Management Points of Compliance** (required) Complete the table provided in Sub-attachment 8.2.
8.3: Geomorphic Assessment of Receiving Channels 1. Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes (provide the information below): Low flow threshold: ☐ 0.1Q2 ☐ 0.3Q2 ☐ 0.5Q2 Title: Date: Preparer: Submit using ☐ the Sub-attachment 8.3 cover sheet provided, or ☐ as a separate stand-alone document labeled Sub-attachment 8.3.
8.4: Vector Control Plan (required if BMPs will not drain in less than 96 hours) ☐ Included with this attachment ☐ Not required

[1] Including Structural BMP Drawdown Calculations and Overflow Design Summary. See BMPDM Chapter 6 and Appendix G for additional design guidance.

8.1 Flow Control Facility Design

Insert Flow Control Facility Design behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.1.

8.2 Hydromodification Management Points of Compliance

- List and describe all points of compliance (POCs) for flow control for hydromodification management.
- For each POC, provide a POC identification name or number, and a receiving channel identification name or number correlating to the project's HMP Exhibit (see Attachment 2).

POC name or #	Channel name or #	POC Description
POC-1	San Dieguito River	Offsite Outfall Low Point

8.3 Geomorphic Assessment of Receiving Water Channels

Insert Geomorphic Assessment behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.3.

8.4 Vector Control Plan

Insert Vector Control Plan behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.4.

SWMM ANALYSIS

FLOW DURATION CURVE ANALYSIS

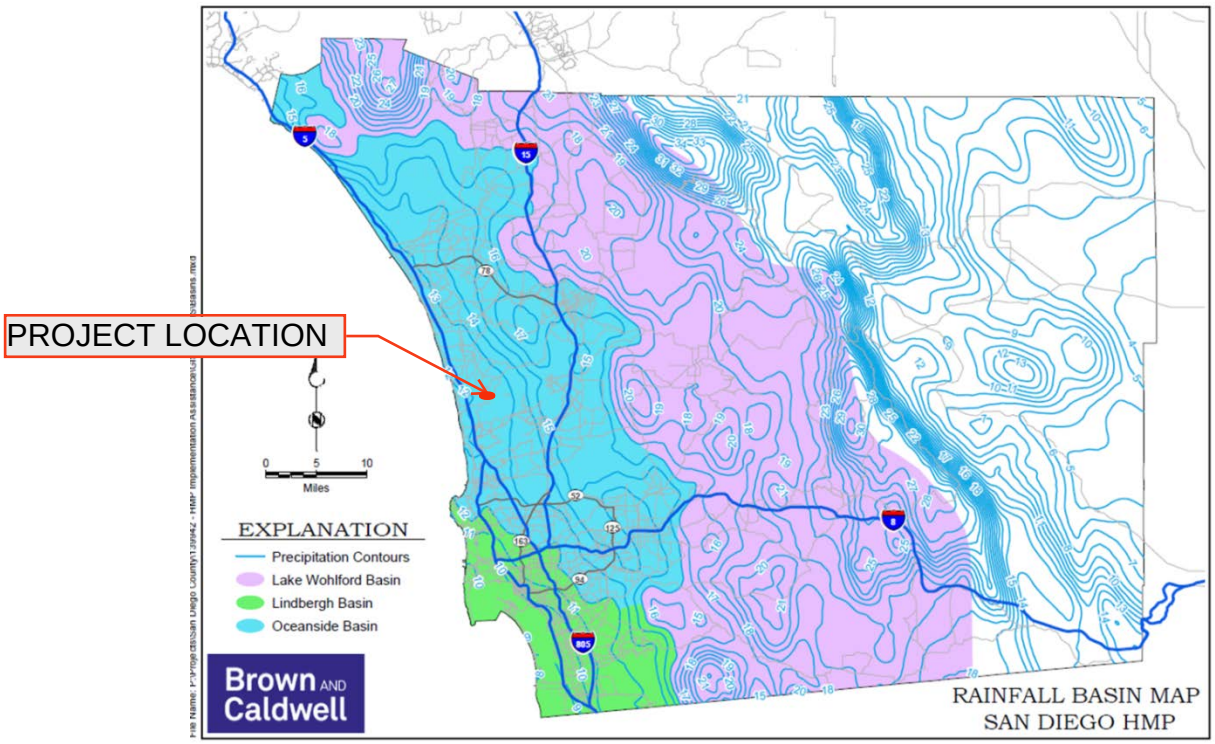


Figure G.2-2: Rainfall Basin Map

Table G.2-1: Runoff factors for surfaces draining to BMPs for Hydromodification Sizing Factors Method

Surface	Runoff Factor
Roofs	1.0
Concrete	1.0
Pervious Concrete	0.10
Porous Asphalt	0.10
Grouted Unit Pavers	1.0
Solid Unit Pavers on granular base, min. 3/16 inch joint space	0.20
Crushed Aggregate	0.10
Turf block	0.10
Amended, mulched soils	0.10
Landscape	0.10

INTRODUCTION:

The approach used to model the proposed commercial redevelopment project site in the County of San Diego using the Environmental Agency (EPA) Storm Water Management Model 5.1 (SWMM). SWMM models were prepared for the pre and post-development conditions at the project site to determine if the underground storage has sufficient volume to meet Hydromodification Management Plan (HMP) requirements. The San Diego Regional Water Quality Control board (SDRWQCB) established these requirements in the final HMP , dated March 2011, prepared for the County of San Diego by Brown and Caldwell, as modified by the HMP dated September 15, 2020 County of San Diego BMP Design Manual.

SWMM MODEL DEVELOPMENT

Proposed redevelopment project site consists of a religious assembly, administration offices, 2 religious school classrooms and meeting spaces for the congregation with associated driveway and parking lot, flatwork, utilities, other associated improvement, treatment system (MWS) and underground storage (Chamber system). The project site located on Via De La Valle approximately 1.5 mile from Interstate 5. SWMM models were prepared for this study, one for pre-development (DMA-1) and one for post-development conditions DMA 1-6 with Point of Compliance (POC-1) located on the west of the project site, as shown on the Pre and Post-development HMP maps.

For both SWMM models, flow duration curves were prepared for POC-1 to determine if the proposed HMP facility is sufficient to meet the current HMP requirements. Table 1.0 summarizes the contributing area for POC-1 in pre and post-development conditions.

TABLE 1.0

POC	Pre-Dev Area (ac)	Post-Dev Area (ac)
1	2.72	2.72

The inputs required to develop SWMM models include rainfall, watershed characteristics, and Integrated Management Practices (IMP) configurations. The Oceanside gauge from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation due to elevation and proximity of the project site.

Evaporation for the site was modeled using average monthly values from the County of San Diego BMP Design Manual Appendices, Table G.1-1. According to the NRCS Websoil Survey, the site has a soils type “D”.

HMP MODELING

PROPOSED CONDITION

POC-1

POC-1 is located on the west corner of project site prior to discharging offsite as it does in existing condition. The DMA-1 being treated and stored by MWS-1 and underground storage. The DMA-2 also get treated by MWS-2 prior to discharge offsite. The DMAs 3-6 bypass the site via storm drain systems into west driveway low point where they confluence with the treated and detained runoff from DMA-1 and treated runoff from DMA-2 prior to discharging offsite and then into unlined channel at the downstream of the site and ultimately drains into San Dieguito River which is HMP exempted system.
IMP-1.2 (Chamber System) in DMA-1 will provide adequate volume capacity for site hydromodification requirements at POC-1. Flow will discharge from underground storage via low flow orifices to the receiving storm drain systems.

TABLE 1.1- Summary of Existing Condition for POC-1

DMA	Tributary Area, A(ac)	Impervious Percentage, IP
DMA-1	2.72	0%

ABLE 1.2- Summary of Developed Condition for POC-1

DMA	Tributary Area, A(ac)	Impervious Percentage, IP
DMA-1	1.50	75%
DMAS (2-6)	1.22	57%

BMP MODELING FOR HMP PURPOSES

* The Green Ampt data's for Soil C are selected for this site that is soil type C and D

FLOW DURATION CURVE COMPARISON

The flow Duration Curve (FDC) were compared at the project's POCs by exporting the hourly runoff time result from the SWMM to a spreadsheet. For each POC, the FDC was compared between 10% of the existing condition Q2 up to the existing condition Q10. Q2 and Q10 were determined by the statistics analysis report exported to spreadsheet from the SWMM model, which is based on the Weibull Plotting Positions. The runoff time series was also exported from the SWMM model to a spreadsheet to calculate flow durations.

The range between 10% of Q2 and Q10 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 (Qi 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 for each POC is illustrated in Figures 1 through 4 in both normal and logarithmic scale.

As can be seen in Figures 1 through 4, the FDCs for the proposed condition with the HMP facilities are within 110% of the curve for the existing condition in both peak flow and duration. The additional runoff volume generated from developing the site will be released to the storm drain system at a flow rate below the 10% Q2 lower threshold. Additionally, the project will not increase peak flow rates between the Q2 and the Q10, as shown in the graphics and also in the peak flow tables in Attachment 1.

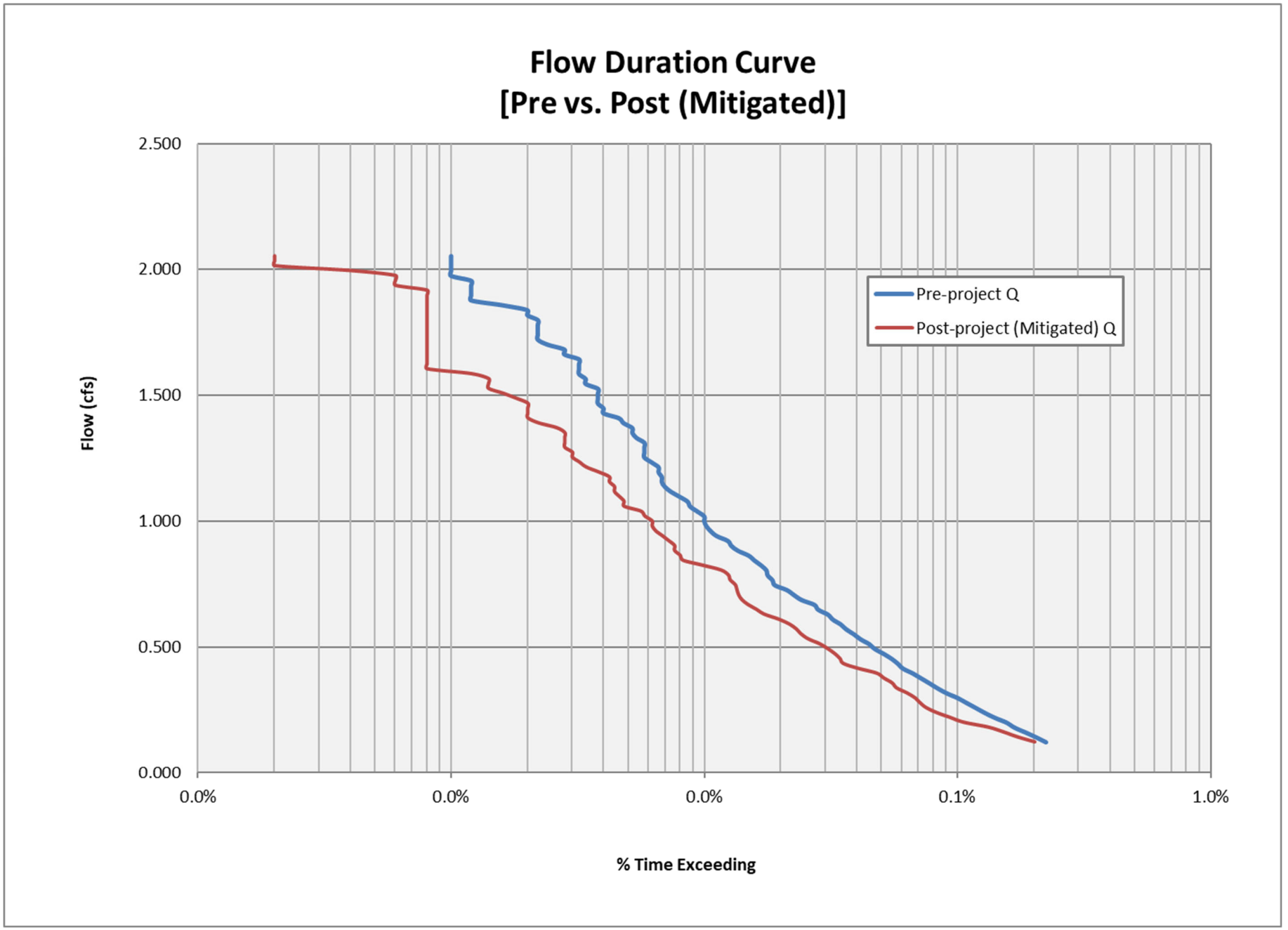
SUMMARY

This study has demonstrated that the proposed underground storage system (chamber) provided within the Chabad project is sufficient to meet the current HMP criteria as specified within the proposed project site.

KEY ASSUMPTIONS

1. The underground storag system (chambers) is lined in order to prevent infiltration into the underlying soil.

DMA-1


Flow Duration Curve
[Pre vs. Post (Mitigated)]
2.500
2.000
1.500
1.000
0.500
0.000
Flow (cfs)
0.0%
0.0%
0.0%
0.1%
1.0%
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

Q2 to Q10 Comparison Table- POC-1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	1.218	0.843	0.375
3-year	1.414	1.113	0.301
4-year	1.611	1.236	0.375
5-year	1.688	1.362	0.326
6-year	1.762	1.388	0.374
7-year	1.853	1.469	0.384
8-year	1.859	1.516	0.344
9-year	1.915	1.549	0.366
10-year	2.053	1.580	0.473

Lower Flow Threshold:	10%	
0.1xQ2 (Pre):	0.1218	cfs
Q10 (Pre):	2.0529	cfs
# of Ordinates:	99	
Incremental Q (pre)	0.0195	cfs
Total Hourly Data:	499320	hours

Interval	Pre-project Flow (cfs)	Pre-Project Hours	Pre-project % Time Exceeding	Post-Project Hours	Post-project % Time Exceeding	Percentage	Pass?Fail
1	0.122	1120	0.2%	1006	0.20%	90	pass
2	0.141	1025	0.2%	862	0.17%	84	pass
3	0.161	930	0.2%	760	0.15%	82	pass
4	0.180	840	0.2%	661	0.13%	79	pass
5	0.200	782	0.2%	527	0.11%	67	pass
6	0.219	702	0.1%	465	0.09%	66	pass
7	0.239	641	0.1%	411	0.08%	64	pass
8	0.258	591	0.1%	374	0.07%	63	pass
9	0.278	544	0.1%	354	0.07%	65	pass
10	0.297	502	0.1%	338	0.07%	67	pass
11	0.317	453	0.1%	314	0.06%	69	pass
12	0.336	417	0.1%	286	0.06%	69	pass
13	0.356	388	0.1%	275	0.06%	71	pass
14	0.375	360	0.1%	255	0.05%	71	pass
15	0.395	334	0.1%	239	0.05%	72	pass
16	0.414	305	0.1%	201	0.04%	66	pass
17	0.434	291	0.1%	176	0.04%	60	pass
18	0.453	275	0.1%	171	0.03%	62	pass
19	0.473	256	0.1%	163	0.03%	64	pass
20	0.492	236	0.0%	153	0.03%	65	pass
21	0.512	224	0.0%	142	0.03%	63	pass
22	0.531	207	0.0%	128	0.03%	62	pass
23	0.551	195	0.0%	120	0.02%	62	pass
24	0.570	182	0.0%	115	0.02%	63	pass
25	0.590	173	0.0%	108	0.02%	62	pass
26	0.609	161	0.0%	98	0.02%	61	pass
27	0.629	154	0.0%	86	0.02%	56	pass
28	0.648	141	0.0%	80	0.02%	57	pass
29	0.668	136	0.0%	74	0.01%	54	pass

30	0.687	121	0.0%	70	0.01%	58	pass
31	0.707	113	0.0%	68	0.01%	60	pass
32	0.726	106	0.0%	67	0.01%	63	pass
33	0.746	95	0.0%	66	0.01%	69	pass
34	0.765	93	0.0%	63	0.01%	68	pass
35	0.785	89	0.0%	62	0.01%	70	pass
36	0.805	88	0.0%	58	0.01%	66	pass
37	0.824	84	0.0%	49	0.01%	58	pass
38	0.844	79	0.0%	41	0.01%	52	pass
39	0.863	75	0.0%	40	0.01%	53	pass
40	0.883	68	0.0%	38	0.01%	56	pass
41	0.902	64	0.0%	38	0.01%	59	pass
42	0.922	62	0.0%	36	0.01%	58	pass
43	0.941	56	0.0%	34	0.01%	61	pass
44	0.961	53	0.0%	32	0.01%	60	pass
45	0.980	51	0.0%	31	0.01%	61	pass
46	1.000	50	0.0%	31	0.01%	62	pass
47	1.019	50	0.0%	29	0.01%	58	pass
48	1.039	47	0.0%	28	0.01%	60	pass
49	1.058	44	0.0%	24	0.00%	55	pass
50	1.078	43	0.0%	24	0.00%	56	pass
51	1.097	40	0.0%	23	0.00%	58	pass
52	1.117	37	0.0%	22	0.00%	59	pass
53	1.136	35	0.0%	22	0.00%	63	pass
54	1.156	34	0.0%	21	0.00%	62	pass
55	1.175	34	0.0%	21	0.00%	62	pass
56	1.195	33	0.0%	19	0.00%	58	pass
57	1.214	33	0.0%	17	0.00%	52	pass
58	1.234	31	0.0%	16	0.00%	52	pass
59	1.253	29	0.0%	15	0.00%	52	pass
60	1.273	29	0.0%	15	0.00%	52	pass
61	1.292	29	0.0%	14	0.00%	48	pass
62	1.312	29	0.0%	14	0.00%	48	pass
63	1.331	27	0.0%	14	0.00%	52	pass
64	1.351	26	0.0%	14	0.00%	54	pass
65	1.370	26	0.0%	13	0.00%	50	pass
66	1.390	24	0.0%	11	0.00%	46	pass
67	1.409	23	0.0%	10	0.00%	43	pass
68	1.429	20	0.0%	10	0.00%	50	pass

69	1.448	20	0.0%	10	0.00%	50	pass
70	1.468	19	0.0%	10	0.00%	53	pass
71	1.487	19	0.0%	9	0.00%	47	pass
72	1.507	19	0.0%	8	0.00%	42	pass
73	1.526	19	0.0%	7	0.00%	37	pass
74	1.546	17	0.0%	7	0.00%	41	pass
75	1.565	17	0.0%	7	0.00%	41	pass
76	1.585	16	0.0%	6	0.00%	38	pass
77	1.604	16	0.0%	4	0.00%	25	pass
78	1.624	16	0.0%	4	0.00%	25	pass
79	1.643	16	0.0%	4	0.00%	25	pass
80	1.663	14	0.0%	4	0.00%	29	pass
81	1.682	14	0.0%	4	0.00%	29	pass
82	1.702	12	0.0%	4	0.00%	33	pass
83	1.721	11	0.0%	4	0.00%	36	pass
84	1.741	11	0.0%	4	0.00%	36	pass
85	1.760	11	0.0%	4	0.00%	36	pass
86	1.780	11	0.0%	4	0.00%	36	pass
87	1.799	11	0.0%	4	0.00%	36	pass
88	1.819	10	0.0%	4	0.00%	40	pass
89	1.838	10	0.0%	4	0.00%	40	pass
90	1.858	8	0.0%	4	0.00%	50	pass
91	1.877	6	0.0%	4	0.00%	67	pass
92	1.897	6	0.0%	4	0.00%	67	pass
93	1.916	6	0.0%	4	0.00%	67	pass
94	1.936	6	0.0%	3	0.00%	50	pass
95	1.955	6	0.0%	3	0.00%	50	pass
96	1.975	5	0.0%	3	0.00%	60	pass
97	1.994	5	0.0%	2	0.00%	40	pass
98	2.014	5	0.0%	1	0.00%	20	pass
99	2.033	5	0.0%	1	0.00%	20	pass
100	2.053	5	0.0%	1	0.00%	20	pass

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

PRE-DEV INPUT (POC-1)

```
[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           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
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         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1
```

```
[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.110  0.15   0.17   0.19   0.19   0.18   0.15   0.11   0.08   0.06
DRY_ONLY         NO

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

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ---------
DMA_1            Oceanside        POC-1            2.725    0        335      2.6      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA_1            0.012      0.15       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA_1            9          0.01875    0.30       7          0

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

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Oceanside        FILE "Z:\Projects\2023\23-221\PROD\Reports\WQMP\SWMM\oceanside.dat"
```

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

[TAGS]

[MAP]
DIMENSIONS -966.709 0.000 10966.709 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ----------
POC-1            -380.739           582.919

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ----------
DMA_1            -494.717           551.400
DMA_1            -442.956           551.400
DMA_1            -439.819           598.455
DMA_1            -494.717           600.024

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ----------
Oceanside        -455.102           623.163
```

POST-DEV INPUT (POC-1)

```
[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           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
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         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4
```

```
[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .06    .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO

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

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ---------
POST_DMA-1       Oceanside        IMP-1.1-MWS      1.504    75       307      2.6      0
IMP-1.1-MWS      Oceanside        J-MWS            0.0005   0        10       0        0
DMA(2-6)         Oceanside        POC-1            1.22     57       200      7        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
POST_DMA-1       0.012      0.15       0.05       0.1        25         OUTLET
IMP-1.1-MWS      0.012      0.15       0.05       0.1        25         OUTLET
DMA(2-6)         0.012      0.1        25         0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
POST_DMA-1       9          0.01875    0.3        7          0
IMP-1.1-MWS      1.5        0.3        0.33       7          0
DMA(2-6)         9          0.01875    0.3        7          0

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
IMP-1            BC
IMP-1            SURFACE    0.1        0.0        0          0          5
IMP-1            SOIL       6          0.4        0.2        0.1        0.2        5          1.5
IMP-1            STORAGE    6          0.67       100        0
IMP-1            DRAIN      30         0          0          6          0          0
```

```
[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo
FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ----------------
----------
IMP-1.1-MWS      IMP-1            1       21.78      0          0          100        0          *                        POC-1           0


[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
J-MWS            100        0          0          0          0

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

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          -------- --------
IMP1.2-Storage-1 92       5.5        0          TABULAR    Storage-1                    0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Pipe             J-MWS            IMP1.2-Storage-1 400        0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
Orifices         IMP1.2-Storage-1 POC-1            0          TABULAR/HEAD    RatingCurve                 NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
Pipe             CIRCULAR     2                0          0          0          1
```

```
[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ---------
;Orifices
RatingCurve      Rating     0          0
RatingCurve                 0.0833     0.0016
RatingCurve                 0.1667     0.0025
RatingCurve                 0.2500     0.0031
RatingCurve                 0.3333     0.0037
RatingCurve                 0.4167     0.0041
RatingCurve                 0.5000     0.0045
RatingCurve                 0.5833     0.0049
RatingCurve                 0.6667     0.0053
RatingCurve                 0.7500     0.0056
RatingCurve                 0.8333     0.0059
RatingCurve                 0.9167     0.0062
RatingCurve                 1.0000     0.0065
RatingCurve                 1.0833     0.0068
RatingCurve                 1.1667     0.0070
RatingCurve                 1.2500     0.0073
RatingCurve                 1.3333     0.0075
RatingCurve                 1.4167     0.0078
RatingCurve                 1.5000     0.0080
RatingCurve                 1.5833     0.0082
RatingCurve                 1.6667     0.0084
RatingCurve                 1.7500     0.0086
RatingCurve                 1.8333     0.0088
RatingCurve                 1.9167     0.0090
RatingCurve                 2.0000     0.0092
RatingCurve                 2.0833     0.0094
RatingCurve                 2.1667     0.0096
RatingCurve                 2.2500     0.0098
RatingCurve                 2.3333     0.0100
RatingCurve                 2.4167     0.0102
RatingCurve                 2.5000     0.0103
RatingCurve                 2.5833     0.0105
RatingCurve                 2.6667     0.0107
RatingCurve                 2.7500     0.0108
RatingCurve                 2.8333     0.0110
RatingCurve                 2.9167     0.0112
RatingCurve                 3.0000     0.0113
RatingCurve                 3.0833     0.3518
RatingCurve                 3.1667     0.5315
RatingCurve                 3.2500     0.6635
RatingCurve                 3.3333     0.7730
RatingCurve                 3.4167     0.8686
RatingCurve                 3.5000     0.9546
RatingCurve                 3.5833     1.0334
RatingCurve                 3.6667     1.1066
RatingCurve                 3.7500     1.1752
RatingCurve                 3.8333     1.2400
RatingCurve                 3.9167     1.3015
RatingCurve                 4.0000     1.3602
RatingCurve                 4.0833     1.3803
RatingCurve                 4.1667     1.4292
RatingCurve                 4.2500     1.4766
RatingCurve                 4.3333     1.5224
RatingCurve                 4.4167     1.5669
RatingCurve                 4.5000     1.6101
RatingCurve                 4.5833     1.6523
RatingCurve                 4.6667     1.6933
RatingCurve                 4.7500     1.7334
RatingCurve                 4.8333     1.7726
RatingCurve                 4.9167     1.8110
RatingCurve                 5.0000     1.8485
RatingCurve                 5.0833     1.8853
RatingCurve                 5.1667     1.9214
RatingCurve                 5.2500     1.9568
RatingCurve                 5.3333     1.9916
RatingCurve                 5.4167     2.0257
RatingCurve                 5.5000     2.0594
```

```
;
;40 Chamber
Storage-1        Storage    0.00       840.00
Storage-1                   0.08       840.00
Storage-1                   0.17       840.00
Storage-1                   0.25       840.00
Storage-1                   0.33       840.00
Storage-1                   0.42       840.00
Storage-1                   0.50       840.00
Storage-1                   0.58       840.00
Storage-1                   0.67       840.00
Storage-1                   0.75       840.00
Storage-1                   0.83       1875.17
Storage-1                   0.92       1865.85
Storage-1                   1.00       1859.55
Storage-1                   1.08       1853.33
Storage-1                   1.17       1846.57
Storage-1                   1.25       1839.92
Storage-1                   1.33       1832.72
Storage-1                   1.42       1825.33
Storage-1                   1.50       1817.45
Storage-1                   1.58       1809.11
Storage-1                   1.67       1800.42
Storage-1                   1.75       1791.30
Storage-1                   1.83       1781.77
Storage-1                   1.92       1771.62
Storage-1                   2.00       1761.08
Storage-1                   2.08       1750.18
Storage-1                   2.17       1737.90
Storage-1                   2.25       1725.67
Storage-1                   2.33       1712.94
Storage-1                   2.42       1699.26
Storage-1                   2.50       1684.73
Storage-1                   2.58       1669.58
Storage-1                   2.67       1653.68
Storage-1                   2.75       1636.94
Storage-1                   2.83       1619.39
Storage-1                   2.92       1600.87
Storage-1                   3.00       1581.41
Storage-1                   3.08       1560.92
Storage-1                   3.17       1538.91
Storage-1                   3.25       1515.83
Storage-1                   3.33       1491.40
Storage-1                   3.42       1464.94
Storage-1                   3.50       1437.19
Storage-1                   3.58       1406.74
Storage-1                   3.67       1374.46
Storage-1                   3.75       1338.69
Storage-1                   3.83       1299.30
Storage-1                   3.92       1255.06
Storage-1                   4.00       1204.49
Storage-1                   4.08       1139.96
Storage-1                   4.17       1040.83
Storage-1                   4.25       958.48
Storage-1                   4.33       926.28
Storage-1                   4.42       896.93
Storage-1                   4.50       856.73
Storage-1                   4.58       840.00
Storage-1                   4.67       840.00
Storage-1                   4.75       840.00
Storage-1                   4.83       840.00
Storage-1                   4.92       840.00
Storage-1                   5.00       840.00
Storage-1                   5.08       840.00
Storage-1                   5.17       840.00
Storage-1                   5.25       840.00
Storage-1                   5.33       840.00
Storage-1                   5.42       840.00
Storage-1                   5.50       840.00
```

```
[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Oceanside        FILE "Z:\Projects\2021\21-257\PROD\Reports\SWQMP\SWMM\oceanside.dat"

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

[TAGS]

[MAP]
DIMENSIONS -129.191 -319.762 933.945 189.693
Units      Feet

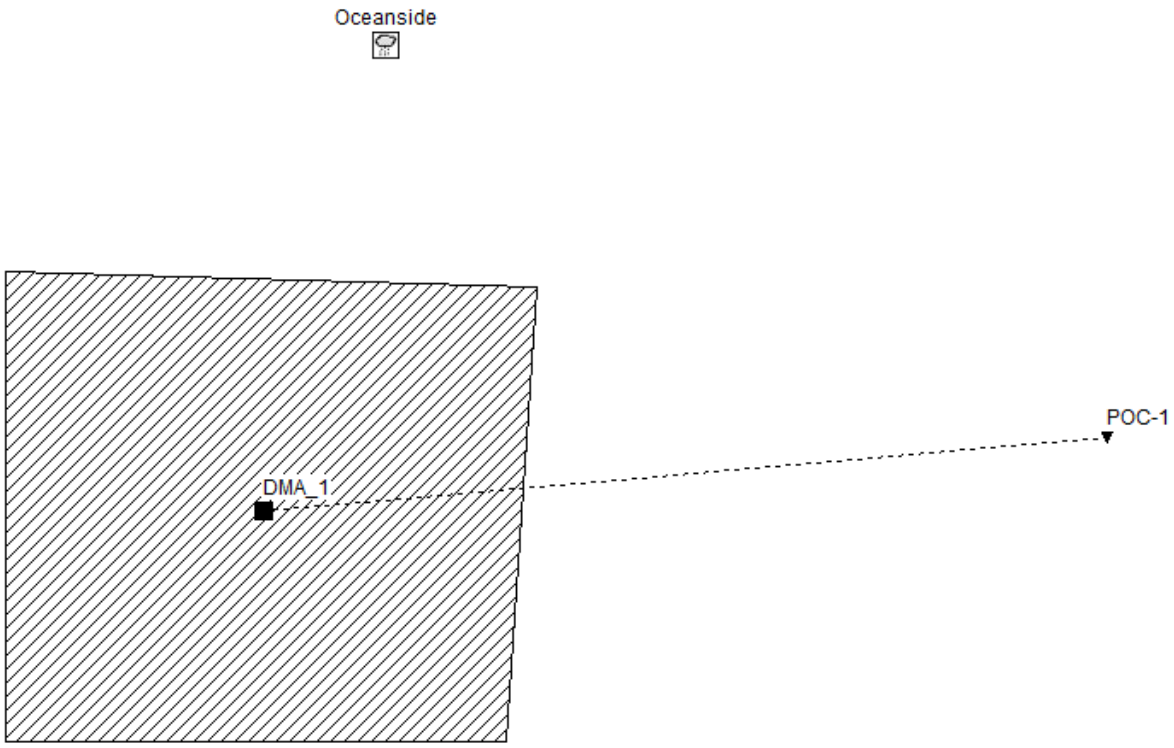
[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
J-MWS            241.184            -83.184
POC-1            382.721            -229.120
IMP1.2-Storage-1 254.858            -137.861

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POST_DMA-1       247.213            95.593
POST_DMA-1       256.463            39.476
POST_DMA-1       173.213            37.009
POST_DMA-1       170.746            93.126
IMP-1.1-MWS      260.988            -15.424
IMP-1.1-MWS      262.222            -51.807
IMP-1.1-MWS      209.188            -53.657
IMP-1.1-MWS      204.871            -19.740
DMA(2-6)         549.896            -145.952
DMA(2-6)         558.611            -195.748
DMA(2-6)         488.274            -201.972
DMA(2-6)         483.917            -152.799

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Oceanside        378.102            145.974
```

PRE-DEVELOPMENT CONDITION (POC-1)



Rain Gage Oceanside

Property	Value
Name	Oceanside
X-Coordinate	-397.011
Y-Coordinate	661.106
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Oceanside
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	-327.846
Y-Coordinate	591.518
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 DMA_1

Property	Value
Name	DMA_1
X-Coordinate	-468.052
Y-Coordinate	575.320
Description	
Tag	
Rain Gage	Oceanside
Outlet	POC-1
Area	2.725
Width	335
% Slope	2.6
% Imperv	0
N-Imperv	0.012
N-Perv	0.15
Dstore-Imperv	0.05
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
N-Perv Pattern	
Dstore Pattern	
Infil. Pattern	

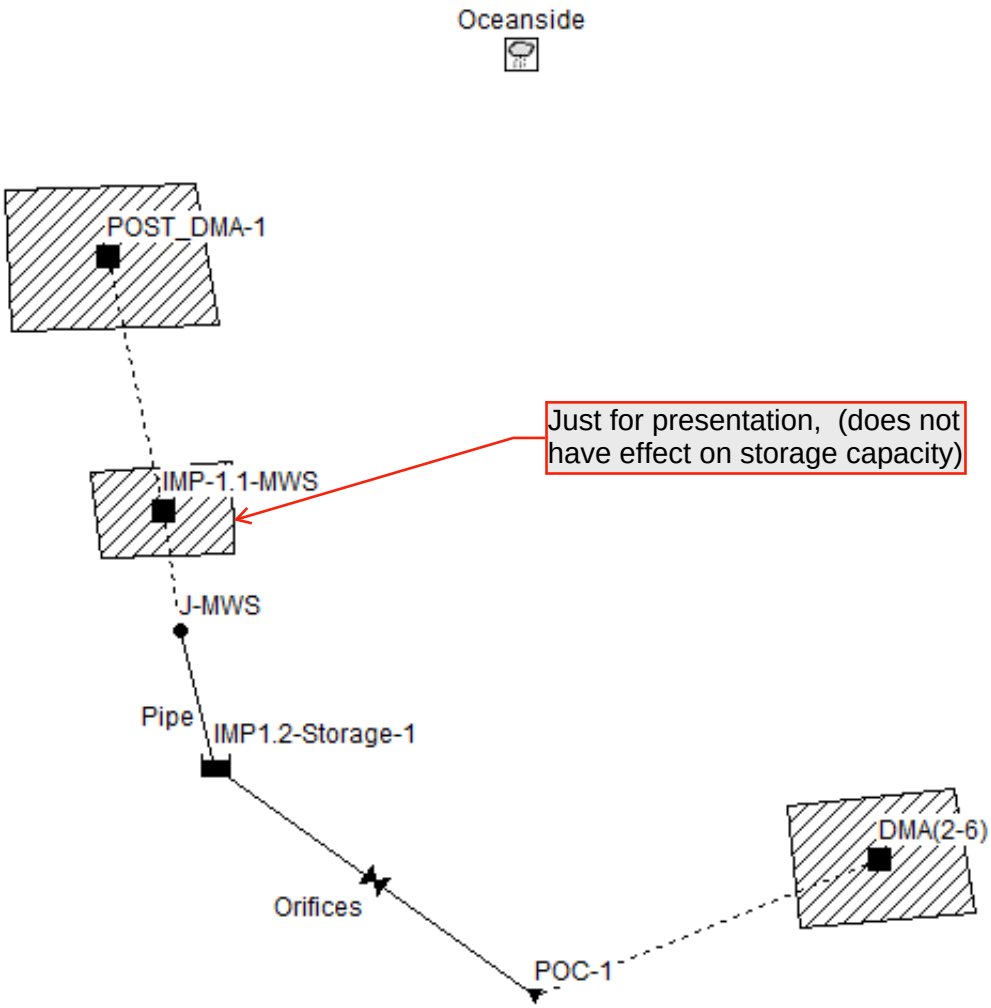
Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.30

Soil capillary suction head (inches or mm)

POST-DEVELOPMENT CONDITION (POC-1)



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	4003.359
Y-Coordinate	3538.634
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	*

Rain Gage OCEANSIDE

Property	Value
Name	OCEANSIDE
X-Coordinate	3027.682
Y-Coordinate	9550.173
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	OCEANSIDE
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Subcatchment POST_DMA-1

Property	Value
Name	POST_DMA-1
X-Coordinate	211.909
Y-Coordinate	66.301
Description	
Tag	
Rain Gage	Oceanside
Outlet	IMP-1.1-MWS
Area	1.504
Width	307
% Slope	2.6
% Imperv	75
N-Imperv	0.012
N-Perv	0.15
Dstore-Imperv	0.05
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
N-Perv Pattern	
Dstore Pattern	
Infil. Pattern	

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.0187
Initial Deficit	0.3

Soil capillary suction head (inches or mm)

Subcatchment IMP-1.1-MWS

Property	Value
Name	IMP-1.1-MWS
X-Coordinate	234.317
Y-Coordinate	-35.157
Description	
Tag	
Rain Gage	Oceanside
Outlet	J-MWS
Area	0.0005
Width	10
% Slope	0
% Imperv	0
N-Imperv	0.012
N-Perv	0.15
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration Data	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0
N-Perv Pattern	
Dstore Pattern	
Infil. Pattern	

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	0.3
Initial Deficit	0.33

Soil capillary suction head (inches or mm)

Junction J-MWS

Property	Value
Name	J-MWS
X-Coordinate	241.184
Y-Coordinate	-83.184
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	100
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0

Conduit Pipe

Property	Value
Name	Pipe
Inlet Node	J-MWS
Outlet Node	IMP1.2-Storage-1
Description	
Tag	
Shape	CIRCULAR
Max. Depth	2
Length	400
Roughness	0.01
Inlet Offset	0
Outlet Offset	0
Initial Flow	0
Maximum Flow	0
Entry Loss Coeff.	0
Exit Loss Coeff.	0
Avg. Loss Coeff.	0
Seepage Loss Rate	0
Flap Gate	NO
Culvert Code	

Storage Unit IMP1.2-Storage-1

Property	Value
Name	IMP1.2-Storage-1
X-Coordinate	254.858
Y-Coordinate	-137.861
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	92
Max. Depth	5.5
Initial Depth	0
Surcharge Depth	0
Evap. Factor	0
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Storage-1

Storage Curve Editor

Curve Name: Storage-1

Description: 40 Chamber

	Depth (ft)	Area (ft2)
1	0.00	840.00
2	0.08	840.00
3	0.17	840.00
4	0.25	840.00
5	0.33	840.00
6	0.42	840.00
7	0.50	840.00
8	0.58	840.00
9	0.67	840.00
10	0.75	840.00
11	0.83	1875.17

View... Load... Save... OK Cancel Help

Outlet Orifices

Property	Value
Name	Orifices
Inlet Node	IMP1.2-Storage-1
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	RatingCurve

Rating Curve Editor

Curve Name: RatingCurve

Description: Orifices

	Head (ft)	Outflow (CFS)
1	0	0
2	0.0833	0.0016
3	0.1667	0.0025
4	0.2500	0.0031
5	0.3333	0.0037
6	0.4167	0.0041
7	0.5000	0.0045
8	0.5833	0.0049
9	0.6667	0.0053
10	0.7500	0.0056
11	0.8333	0.0059

View... Load... Save... OK Cancel Help

Subcatchment DMA(2-6)

Property	Value
Name	DMA(2-6)
X-Coordinate	520.174
Y-Coordinate	-174.118
Description	
Tag	
Rain Gage	Oceanside
Outlet	POC-1
Area	1.22
Width	200
% Slope	7
% Imperv	57
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	25
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
N-Perv Pattern	
Dstore Pattern	
Infil. Pattern	

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.3

Soil capillary suction head (inches or mm)

Summary Files from the SWMM Model

PRE-DEV OUTPUT (POC-1)

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
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 ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 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 ......       153.306       675.110
Evaporation Loss .........         7.449        32.803
Infiltration Loss ........       112.165       493.938
Surface Runoff ...........        36.918       162.574
Final Storage ............         0.000         0.000
Continuity Error (%) .....        -2.104


*************************        Volume         Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        36.918        12.030
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        36.918        12.030
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	675.11	0.00	32.80	493.94	0.00	162.57	162.57	12.03	2.98	0.241

Analysis begun on: Mon Sep 8 09:43:59 2025
Analysis ended on: Mon Sep 8 09:44:11 2025
Total elapsed time: 00:00:12

POST-DEV OUTPUT (POC-1)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 3
Number of nodes 3
Number of links 2
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Oceanside	Oceanside	INTENSITY	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
POST_DMA-1	1.50	307.00	75.00	2.6000	Oceanside	IMP-1.1-MWS
IMP-1.1-MWS	0.00	10.00	0.00	0.0000	Oceanside	J-MWS
DMA(2-6)	1.22	200.00	57.00	7.0000	Oceanside	POC-1

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
IMP-1.1-MWS	IMP-1	1	21.78	0.00	100.00	100.00	0.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J-MWS	JUNCTION	100.00	2.00	0.0	
POC-1	OUTFALL	0.00	0.00	0.0	
IMP1.2-Storage-1	STORAGE	92.00	5.50	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
Pipe	J-MWS	IMP1.2-Storage-1	CONDUIT	400.0	2.0004	0.0100
Orifices	IMP1.2-Storage-1	POC-1	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
Pipe	CIRCULAR	2.00	3.14	0.50	2.00	1	41.59

```
************************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
************************************************************

***************
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 ..... 08/28/1951 05:00:00
Ending Date ..... 05/23/2008 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
*************************     ---------       -------
Initial LID Storage .....          0.000         0.000
Total Precipitation .....        153.219       674.850
Evaporation Loss .....            41.393       182.315
Infiltration Loss .....           35.501       156.364
Surface Runoff .....              77.762       342.500
Final Storage .....                0.007         0.033
Continuity Error (%) .....       -0.943


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------      ---------
Dry Weather Inflow .....           0.000         0.000
Wet Weather Inflow .....          77.762        25.340
Groundwater Inflow .....           0.000         0.000
RDII Inflow .....                  0.000         0.000
External Inflow .....             0.000         0.000
External Outflow .....           77.763        25.340
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 ......         0.002         0.001
Continuity Error (%) .....       -0.004


*******************************
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
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent 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
POST_DMA-1	674.85	0.00	83.20	117.95	436.38	46.05	482.43	19.70	1.79	0.715
IMP-1.1-MWS	674.85	1451145.07	597.23	2756.08	0.00	0.00	1448415.13	19.66	1.79	0.998
DMA(2-6)	674.85	0.00	304.34	202.65	91.70	79.55	171.26	5.67	0.81	0.254

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
IMP-1.1-MWS	IMP-1	1451819.92	597.25	2756.18	1448468.20	0.00	0.60	1.51	-0.00

****
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
J-MWS	JUNCTION	0.00	0.28	100.28	18857 12:16	0.28
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
IMP1.2-Storage-1	STORAGE	0.19	4.46	96.46	18857 12:19	4.15

****
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
J-MWS	JUNCTION	1.79	1.79	18857 12:16	19.7	19.7	0.000
POC-1	OUTFALL	0.81	2.24	18857 12:01	5.67	25.3	0.000
IMP1.2-Storage-1	STORAGE	0.00	1.79	18857 12:16	0	19.7	0.022

****
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
IMP1.2-Storage-1	0.246	3	0	0	6.439	88	18857 12:19	1.59

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	17.48	0.01	2.24	25.338
System	17.48	0.01	2.24	25.338

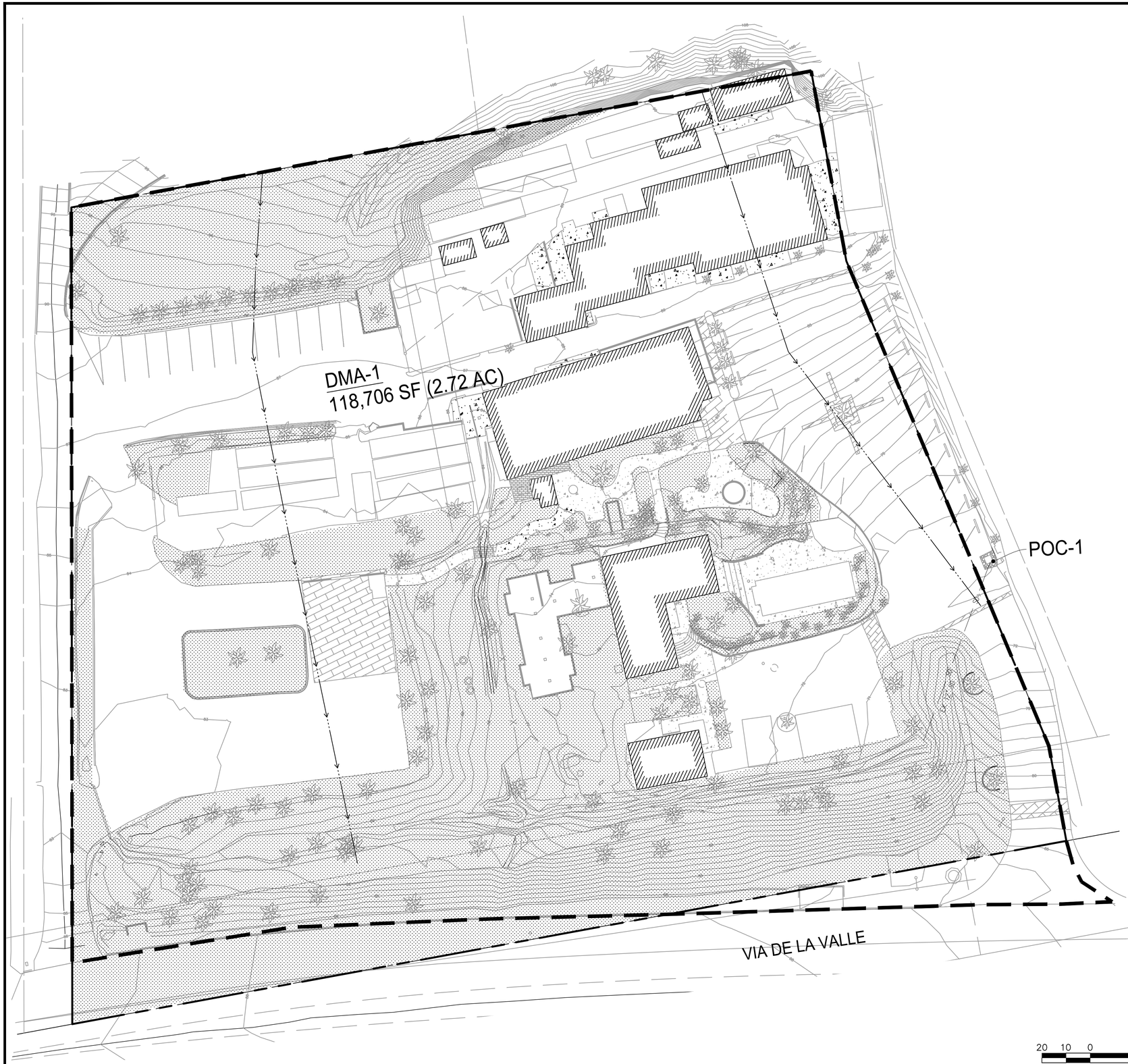
****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Pipe	CONDUIT	1.79	18857 12:16	6.62	0.04	0.14
Orifices	DUMMY	1.59	18857 12:19			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

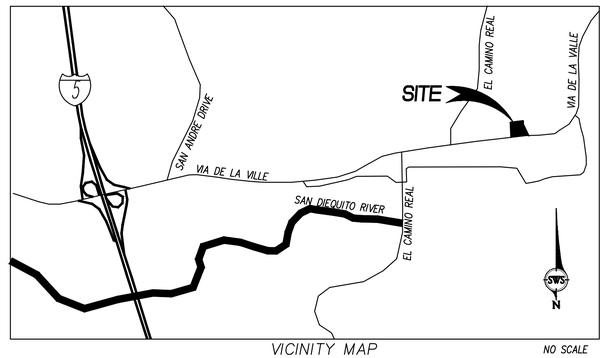
Analysis begun on: Tue Sep 9 13:21:20 2025
Analysis ended on: Tue Sep 9 13:21:41 2025
Total elapsed time: 00:00:21



LEGEND

DMA BOUNDARY	
SITE BOUNDARY	
SOIL TYPE	"D"
GROUNDWATER TABLE	> 50'
OFFSITE BYPASS RUNOFF	
EXISTING LANDSCAPE	
EXISTING BRICK	
EXISTING BRICK	
EXITING CONCRETE	
EXITING CONCRETE WOOD DECK	
AP	
ROOF	
CONTAINER	

No EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS)
No CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED
No PROPOSED DESIGN FEATURES AND SURFACE TREATMENTS USED TO MINIMIZE IMPERVIOUSNESS



VICINITY MAP NO SCALE

20 10 0 20 40 60
SCALE IN FEET
GRAPHIC SCALE

N

PRE HMP MAP

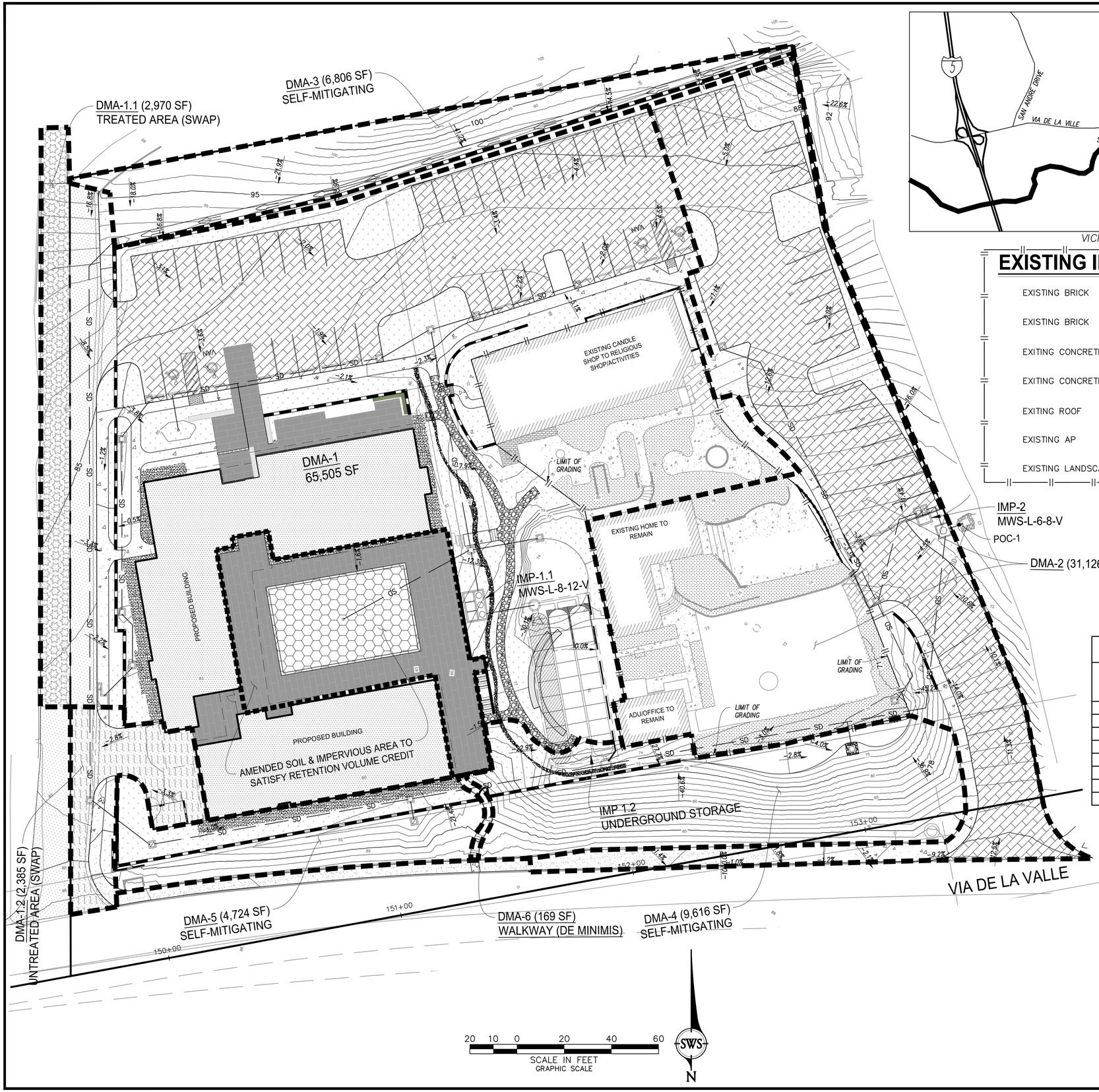
FOR

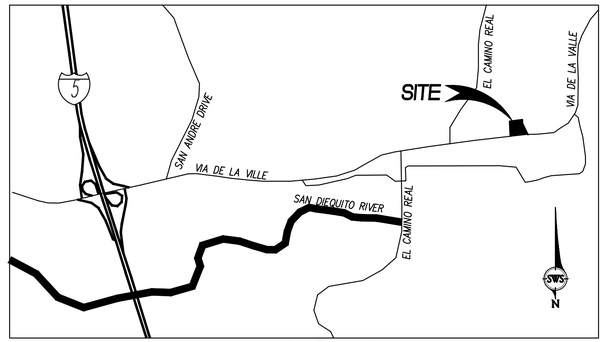
CHABAD RANCHO SANTA FE

SWS ENGINEERING, INC.
Civil Engineering ◆ Land Planning ◆ Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

DATE:9/9/2025 2:41:26 PM BY:MASSY,FATIN
FILE:C:\Projects\2021\21-297\PROD\Reports\SWQMP
FILE NAME:21x36_Pre HMP Map.dwg

24" x 36"





VICINITY MAP NO SCALE

EXISTING IMPERVIOUS

- EXISTING BRICK
- EXISTING BRICK
- EXITING CONCRETE
- EXITING CONCRETE WOOD DECK
- EXITING ROOF
- EXISTING AP
- EXISTING LANDSCAPE

LEGEND

- DMA BOUNDARY
- SOIL TYPE "D"
- GROUNDWATER TABLE > 50'
- PROPOSED STORM DRAIN — SD —
- BOUNDARY TO REMAIN UNDISTURBED
- OFFSITE DRIVEWAY BEING TREATED (SWAPPED) WITH DMA-1.2 THAT WILL NOT BE TREATED
- ONSITE DRIVEWAY/PATHWAY NOT BEING TREATED (SWAPPED) WITH DMA-1.1 THAT WILL BE TREATED
- PROPOSED LANDSCAPE AREA AMENDED SOIL FOR RETENTION VOLUME CREDIT (2,280 SF)
- PROPOSED PAVER IMPERVIOUS AREA DRAINAGE INTO AMENDED SOIL FOR RETENTION VOLUME CREDIT (4,967 SF)
- PROPOSED MULCH
- PROPOSED ROCK
- PROPOSED GRAVEL
- PROPOSED LANDSCAPE AREA
- PROPOSED PERMEABLE PAVER
- PROPOSED LIME STONE
- PROPOSED CONCRETE PAVING
- PROPOSED CONCRETE
- PROPOSED BLDG
- PROPOSED ASH

TABULAR SUMMARY OF DMAs

DMA	IMP #	AREA (SF)	IMPERVIOUS AREA (SF)	% IMP	HSG	AREA WEIGHTED RUNOFF COEFFICIENT	Q (FLOW BASED)	TREATMENT SYSTEM
1	1	65,505	49,240	75	D	0.75	0.339	MWS (BF-3)*
1.1	–	2,970	2,970	100	D	0.9		
1.2		2,385	2.385	100	D	0.9		NOT BEING TREATED (SWAP)*
2	2	31,126	24,934	80	D	0.78	0.167	MWS (BF-3)
3	–	6,806	–	0	D	0.3	–	SELF-MITIGATING
4	–	9,616	–	0	D	0.3	–	SELF-MITIGATING
5	–	4,724	–	0	D	0.3	–	SELF-MITIGATING
6	–	169	169	100	D	0.9	–	DE MINIMIS

*DMA-1.1 IS AN EXISTING OFFSITE WEST DRIVEWAY/STREET TO BE TREATED BY MWS-1 IN EXCHANGE (SWAPPED) WITH THE DMAs 1.2 (ONSITE WEST DRIVEWAY/STREET THAT CANNOT DRAIN INTO MMS FOR TREATMENT

No EXISTING NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS)
No CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED
No PROPOSED DESIGN FEATURES AND SURFACE TREATMENTS USED TO MINIMIZE IMPERVIOUSNESS

POST HMP MAP (1 OF 2)

FOR

CHABAD RANCHO SANTA FE

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

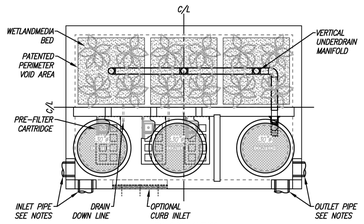
DATE:9/9/2025 11:24:07 AM BY:MASSY,FATIMA
FILE:C:\Projects\2021\21-297\PROD\Reports\SWQMP
FILE NAME:21-297_Post HMP Map.dwg

24" x 36"

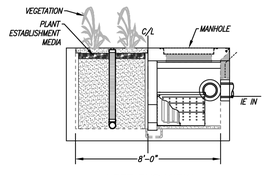
SITE SPECIFIC DATA

PROJECT NUMBER			
PROJECT NAME		Chabad Rancho Santa Fe	
PROJECT LOCATION		14906 Via De La, Ranch Santa Fe, CA	
STRUCTURE ID		IMP-1.1	
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.346
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



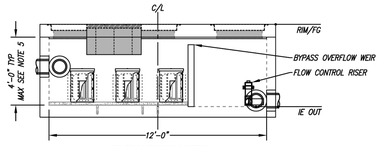
PLAN VIEW



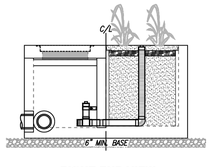
LEFT END VIEW

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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

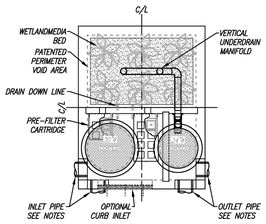
MWS-L-8-12-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

IMP–1.1
PRELIMINARY MWS–L–8–12–V, TO BE DETAILED PER PROPOSED DESIGN AT FINAL ENGINEERING

SITE SPECIFIC DATA

PROJECT NUMBER			
PROJECT NAME		Chabad Rancho Santa Fe	
PROJECT LOCATION		14906 Via De La, Rancho Santa Fe, CA	
STRUCTURE ID		IMP-2	
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.167
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



PLAN VIEW

LEFT 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 MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S 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 FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. 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 WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.

ELEVATION VIEW

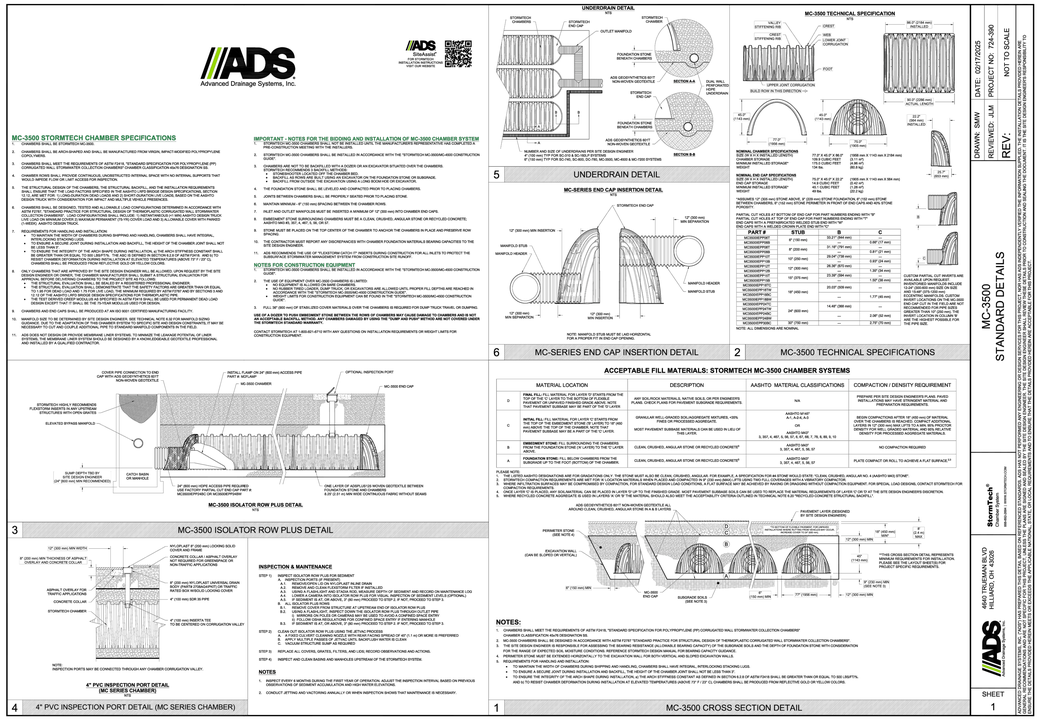
RIGHT END VIEW

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-6-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

IMP–2
PRELIMINARY MWS–L–6–8–V, TO BE DETAILED PER PROPOSED DESIGN AT FINAL ENGINEERING



3 MC-3500 ISOLATOR ROW PLUS DETAIL

4" PVC INSPECTION PORT DETAIL
(MC SERIES CHAMBER)
NTS

4 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

INSPECTION & MAINTENANCE

STEP 1: INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
A. INSPECTION PORTS (IF PRESENT)
A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
A.2. REMOVE AND CLEAN ELEVATOR TUBE ASSEMBLY
A.3. REMOVE LID AND MEASURE SEDIMENT DEPTH (DISTANCE BETWEEN BOTTOM OF CHAMBER AND TOP OF SEDIMENT) AND RECORD ON MAINTENANCE LOG
A.4. LOWER A CAMERA INTO THE ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
A.5. IF SEDIMENT IS AT OR ABOVE 3" (80 mm), PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
B. ALL ISOLATOR PLUS ROWS
B.1. REMOVE MANHOLE STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
I. MARKING ON PIPES OR CHAMBERS MAY BE USED TO AVOID A DOWNPIPE SPACE SURVEY
II. IF FLOW IS PRESENT, SHINE LIGHT INTO ISOLATOR ROW PLUS TO LOCATE THE OUTLET PIPE
B.3. IF SEDIMENT IS AT OR ABOVE 3" (80 mm), PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2: CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
A. APPLY NOZZLE TO UPSTREAM END OF ISOLATOR ROW PLUS (IF REQUIRED, REFER TO 4F-07.1 AND 4F-08.1 IN PREFERRED)
B. APPLY MULTIPLE PASSES OF JETVAC UNTIL SIGNIFICANT WATER IS CLEAN
C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3: REPLACE ALL COVERS, GRATES, FILTERS, AND LOOSE RECORD OBSERVATIONS AND ACTIONS.

STEP 4: INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVED ACCUMULATION OF SEDIMENT AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

MC-3500 STANDARD DETAILS

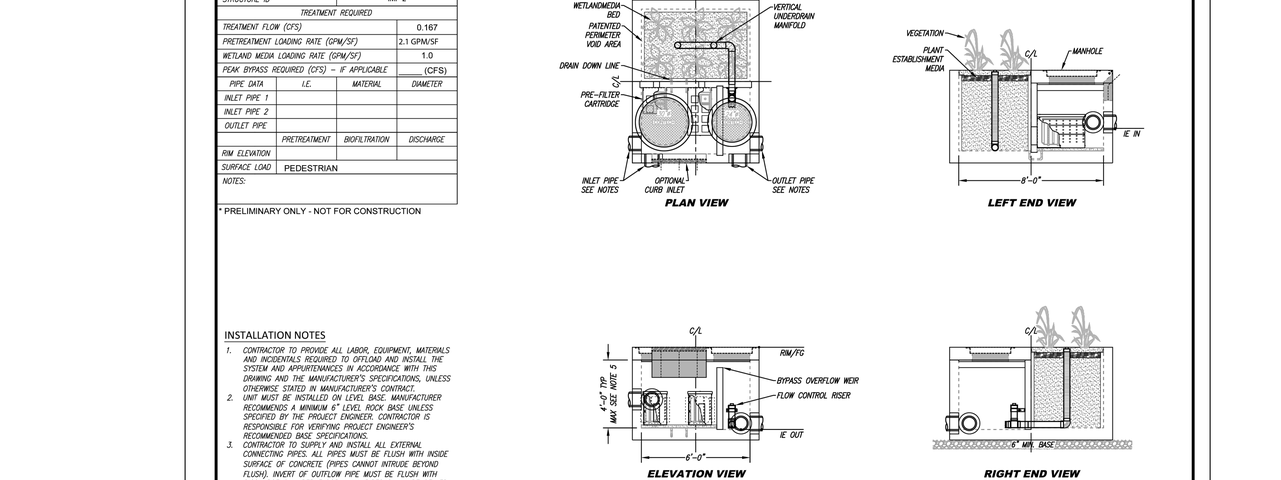
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF STORMTECH. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF STORMTECH IS PROHIBITED. ANY USE OF THIS DRAWING WITHOUT THE EXPRESS WRITTEN CONSENT OF STORMTECH IS PROHIBITED. ANY ELECTRONIC COPIES OF THIS DRAWING ARE CONSIDERED TO BE AN UNCONTROLLED COPY. THIS DRAWING IS SUBJECT TO CHANGE WITHOUT NOTICE. STORMTECH MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND REGARDING THIS DRAWING. IN NO EVENT SHALL STORMTECH BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS DRAWING. THE USER OF THIS DRAWING AGREES TO INDEMNIFY AND HOLD HARMLESS STORMTECH FROM ANY DAMAGES, LIABILITIES, COSTS, OR EXPENSES ARISING OUT OF THE USE OF THIS DRAWING.

StormTech®
800.821.6710
www.stormtech.com

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

DRAWN: SMW	DATE: 02/17/2025
REVIEWED: JLM	PROJECT NO: 724-390
REV:	NOT TO SCALE
SHEET 1	

IMP–1.2
PRELIMINARY MC–3500, TO BE DETAILED PER PROPOSED DESIGN AT FINAL ENGINEERING



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

CHAMBER DETAIL (IMP–1.2)

Scale: NTS

POST HMP MAP (2 OF 2)
FOR
CHABAD RANCHO SANTA FE

SWS ENGINEERING, INC.
Civil Engineering • Land Planning • Surveying
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011
SAN DIEGO - NASHVILLE - PHOENIX - ORLANDO

DATE:9/9/2025 11:17:35 AM BY:MASSY,FATIM
FILE:Z:\Projects\2021\21-207\PROD\Reports\SWQMP
FILE NAME:21-207_Post HMP Map.dwg

24" x 36"

9.0 General Requirements

- Complete the table below to indicate which compliance pathway was selected in PDP SWQMP Table 6. Include the corresponding sub-attachment with your SWQMP submittal. Other sub-attachments do not need to be included.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" for additional explanation of design requirements. Constructed features must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: CCSYAs and applicable BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.

Sub-attachments	BMPDM Design Resources
☐ **9.1: Documentation of Hydromodification Management Exemption**[1]	Section 1.6
☒ **9.2: Watershed Management Area Analysis (WMAA) Mapping**[1]	Appendix H.1.1.2
☐ **9.3: Resource Protection Ordinance (RPO) Methods**	Appendix H.1.1.1
☐ **9.4: No Net Impact Analysis**	Appendix H.4

[1] The San Diego County Regional comprehensive WMAA mapping data can be found on the Project Clean Water website here: http://www.projectcleanwater.org/download/wmaa_attc_data/

9.1 Documentation of Hydromodification Management Exemption (BMPDM Section 1.6)

- If the PDP is exempt from hydromodification management requirements (see Table 4 Part A.1 of the PDP SWQMP), use this Sub-attachment to document the exemption.
- Select the type of exemption below that applies and provide an explanation of the selection, including maps or other applicable documentation. Additional documentation may be requested by County staff.

Exemption Type per BMPDM Figure 1-2 (select one)
☐ a. The proposed project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
☐ b. The proposed 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.
☐ c. The proposed project will discharge runoff directly to an area identified by the County as appropriate for an exemption by the WMAA for the watershed in which the project resides[2].
Explanation (add or attach pages as necessary)

[2] This option must include an analysis of the project using the methodology presented in Attachment E of the Regional Watershed Management Area Analysis.

9.2 Watershed Management Area Analysis (WMAA) Mapping (BMPDM Appendix H.1.1.2)

Watershed Management Area Analysis (WMAA) mapping is a simple way to screen projects to determine the presence of onsite or offsite upstream Potential Critical Coarse Sediment Yield Areas (PCCSYAs). The San Diego County Regional WMAA mapping data can be found on the Project Clean Water website here: http://www.projectcleanwater.org/download/wmaa_attc_data/ .[3]

- Based on the WMAA map and the proposed project design, demonstrate below that both of the following conditions apply to the PDP:

  (a) Less than 5% of PCCSYAs will be impacted (built on or obstructed) by the PDP, and

  (b) All upstream offsite PCCYSAs will be bypassed (see BMPDM Appendix H.3).

A. Mapping Results -- At a minimum, show: (1) the project footprint, (2) areas of proposed development, (3) impacted onsite PCCSYAs, (4) offsite tributary areas[4], and (5) bypass of upstream offsite PCCSYAs.

The site is not within the CCSYA.

The proposed project site will discharge offsite into existing outfall (Low point on the east driveway) and then ultimately discharges into unlined channer prior to discharging into San Dieguito River.

[3] Applicants may refine initial mapping results using options identified in BMPDM Appendix H.1.2.
[4] Tributary areas must be shown to demonstrate that upstream offsite PCCSYAs do not exist. If bypassing these areas, only the bypass should be shown.

B. Explanation -- Provide documentation as needed to demonstrate that (1) impacts to PCCSYAs are below 5%, and (2) upstream offsite PCCYSAs are effectively bypassed. Add pages as necessary.

9.3 Resource Protection Ordinance (RPO) Methods (BMPDM Appendix H.1.1.1)

- Either of two Resource Protection Ordinance (RPO) methods may also be used to demonstrate compliance with CCSYA requirements. Select either option and document the selection below:

☐ **RPO Scenario 1: PDP is subject to and in compliance with RPO requirements**[5]

- **Select** if the project requires one or more discretionary permits;
- **Demonstrate** that onsite AND upstream offsite CCSYAs will be avoided and/or bypassed.

☐ **RPO Scenario 2: PDP is entirely exempt/not subject to RPO requirements**[6]

- **Select** if the project does not require discretionary permits;
- **Demonstrate** that all upstream offsite CCSYAs will be bypassed[7].

A. Mapping Results -- At a minimum, show as applicable: (1) the project footprint, (2) areas of proposed development, (3) locations of onsite and upstream offsite CCSYAs, and (4) bypass of all identified CCSYAs.

[5] RPO applicability is normally confirmed during discretionary review. Check with your project manager if you're not sure of your status.
[6] Does not include PDPs utilizing exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3).
[7] This scenario does not impose requirements for onsite CCSYAs.

B. Explanation -- Provide documentation as needed to demonstrate that (1) onsite CCSYAs are avoided and bypassed [if applicable], and (2) upstream offsite CCYSAs are effectively bypassed. Add pages as necessary.

9.4 No Net Impact Analysis (BMPDM Appendix H.4)

- When impacts to CCSYAs cannot be avoided or effectively bypassed, applicants must demonstrate that their project generates no net impact to the receiving water per the performance metrics identified in BMPDM Appendix H.4.
- Use the space below to document that the PDP will generate no net impact to any receiving water.

No Net Impact Analysis (add or attach pages as necessary)

CCSYA EXHIBIT

